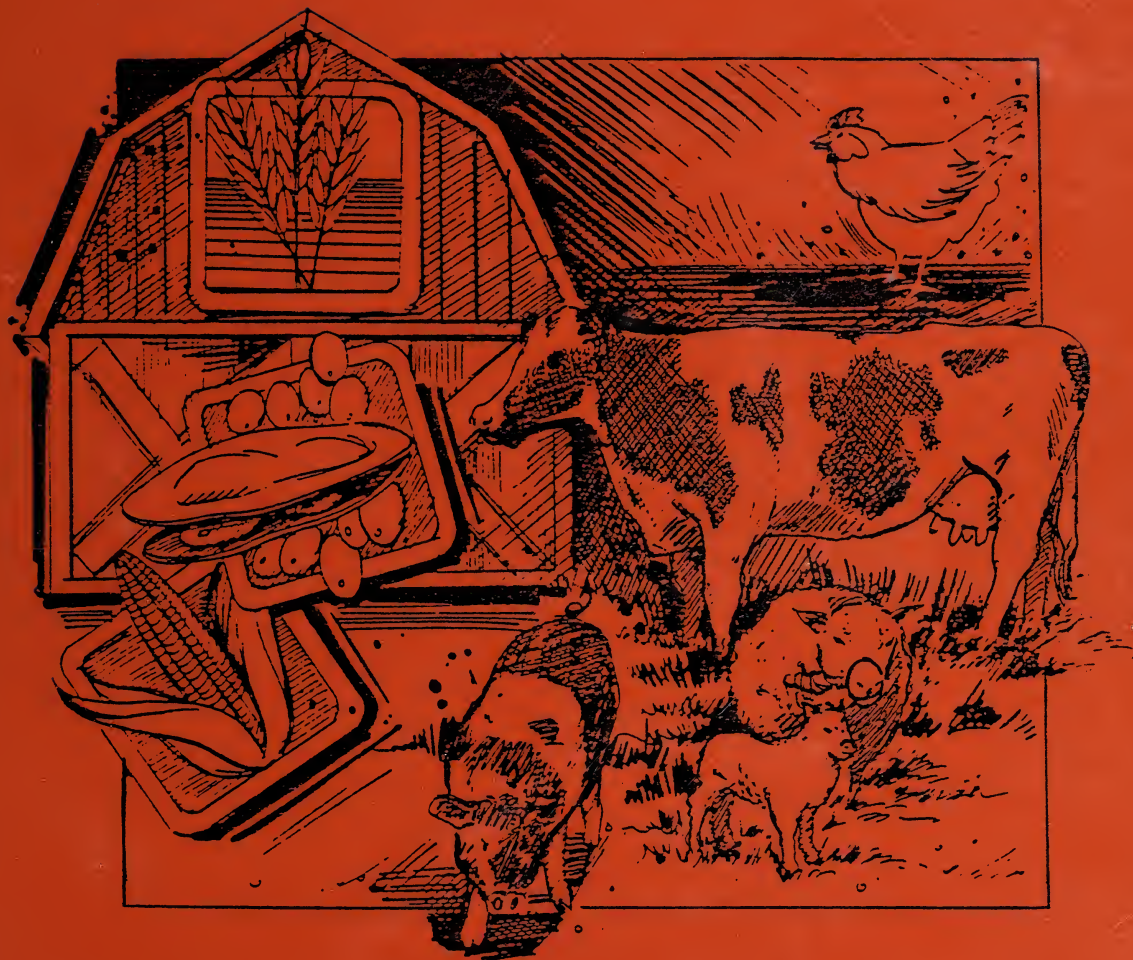


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Student Workbook

Grade 10

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Use Appendix 3: Job Sheet Evaluation Record to monitor your own performance and have your teacher/supervisor and classmates also evaluate your performance each time you complete a job.

INTRODUCTION

AGRICULTURAL PRODUCTION 16 is a course that explores ideas that relate to farming and agricultural industries.

FARMING includes all the work related to raising crops and/or livestock.

AGRICULTURAL INDUSTRIES include businesses that:

- market crops or livestock
- process farm products
- sell finished products
- supply materials to farms.

Agricultural production is the process of raising plants and/or animals and preparing them for sale.

This course will provide opportunities for learning about these activities as well as related careers.

To find out more about some of the skills you will develop in Agricultural Production 16, turn to Appendix 1: Agricultural Production 16 Profile.

ALBERTA AGRICULTURAL PRODUCTS

Many agricultural products are produced in Alberta. Most are food items, but others are things that are used in other ways. Alberta agricultural products include:



• wheat



• barley



• oats



• canola



• flax



• sugar beets



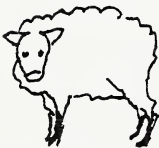
• vegetables



• cattle



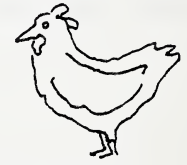
• hogs



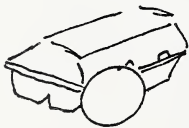
• sheep



• milk



• poultry



• eggs



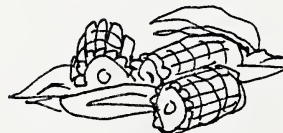
• honey



• hay



• goats



• feed corn



• lentils

Many of the products grown or raised in Alberta are processed into other products.

STUDENT ACTIVITIES

1. Complete the following sentences using the product names listed on page 2. Each answer is an item that can be manufactured from grown or raised Alberta products.

- Noodles, cakes, pizza dough and many other baked products are made from flour which is formed when _____ is ground. _____ are used for animal feed as well as hot breakfast cereal.
- _____ is used for livestock feed and for making beer.
- Cooking oils are made from _____.
- Alfalfa and clover can be cut and baled to make _____.
- Sugar is refined from _____.
- Ten vegetables grown in Alberta are _____,
_____, _____,
_____, _____,
_____ and _____.
- Beef comes from _____ and pork comes from _____.
- Lambs are young _____.
- Cheese, ice cream and yogurt are made from _____.
- Chicken, turkeys and ducks are types of _____.
- Laying hens produce _____.
- Bees may use alfalfa or clover when they are making _____.

AGRICULTURAL CAREERS

Agriculture provides many jobs and careers for Albertans. Some of these are directly related to farming. Other jobs are found in industries related to the products grown or raised. Careers in agricultural production include:

Animal Health Technician

Agricultural Mechanic

Beef Producer

Beekeeper

Broiler Producer

Butcher

Certified Seed Grower

Cheese Maker

Commercial Vegetable Farmer

Dairy Farmer

Dairy Inspector

Dairy Products Tester

Egg Producer

Farm Building Maintenance Person

Farm Hand

Farm Machinery Salesperson

Farm Supplies Salesperson

Feedlot Operator

Feedmill Operator

Feeds Salesperson

Forestry Worker

Grain and Flour Miller

Grain Elevator Agent

Grain Farmer

Greenhouse Operator

Hog Producer

Irrigation Maintenance Person

Livestock Buyer

Meat Cutter

Meat Inspector

Meat Processing Manager

Plant Breeding Technician

Poultry Processing Manager

Seed Testing Technician

Sheep Producer

Veterinarian

Veterinary Assistant

STUDENT ACTIVITIES

1. Brainstorm: What other jobs are related to the agricultural industry?

2. a. In the space provided, draw or attach a copy of a picture of the agricultural career that is of most interest to you.

- b. What is the name of this career? Why does it interest you?

JOB SHEET 1

INVESTIGATING AN AGRICULTURAL CAREER

EQUIPMENT, TOOLS AND SUPPLIES

- Pencil

PROCEDURE

Note: This job sheet may be completed individually or as part of a presentation by a community partner.

1. Contact someone who has an agriculture related career and arrange a meeting.
2. Discuss their career, using the Interview Guide (page 7).
3. Thank the person for their assistance by letter or as directed by your teacher/supervisor.
4. Answer the questions in the Interview Guide.

INTERVIEW GUIDE

- What is the name of the job you do? _____
- Where do you do this job? _____
- What are your regular hours of work? _____
- Describe your job. _____

- Is special equipment or machinery used to perform your job? Describe it. _____

- What training is needed for this job? _____

- Where did you get your training? Is training available elsewhere? _____

- What are the advantages of your job? _____

- What are the disadvantages of your job? _____

- What other information have you learned from this interview? _____

Many careers and jobs depend on agriculture but are not directly involved in growing crops or raising livestock. For example, a town in a farming area has storekeepers and businesses serving the people who work in agriculture. These towns depend on sales and service to the people working in agriculture.

STUDENT ACTIVITIES

1. What agriculture related stores and services are available for the people living and working in the local community? Make a list of some of these businesses and explain what each offers to customers.

Business Type	Sales and Services Offered

Many different products are grown in Alberta. Not all areas of the province produce the same crops or raise the same animals.

STUDENT ACTIVITIES

1. Make a list of the crops or livestock that you know are locally produced.

_____	_____	_____
_____	_____	_____

2. a. Research other sources of information about additional crops that may be locally produced. Some resources include:

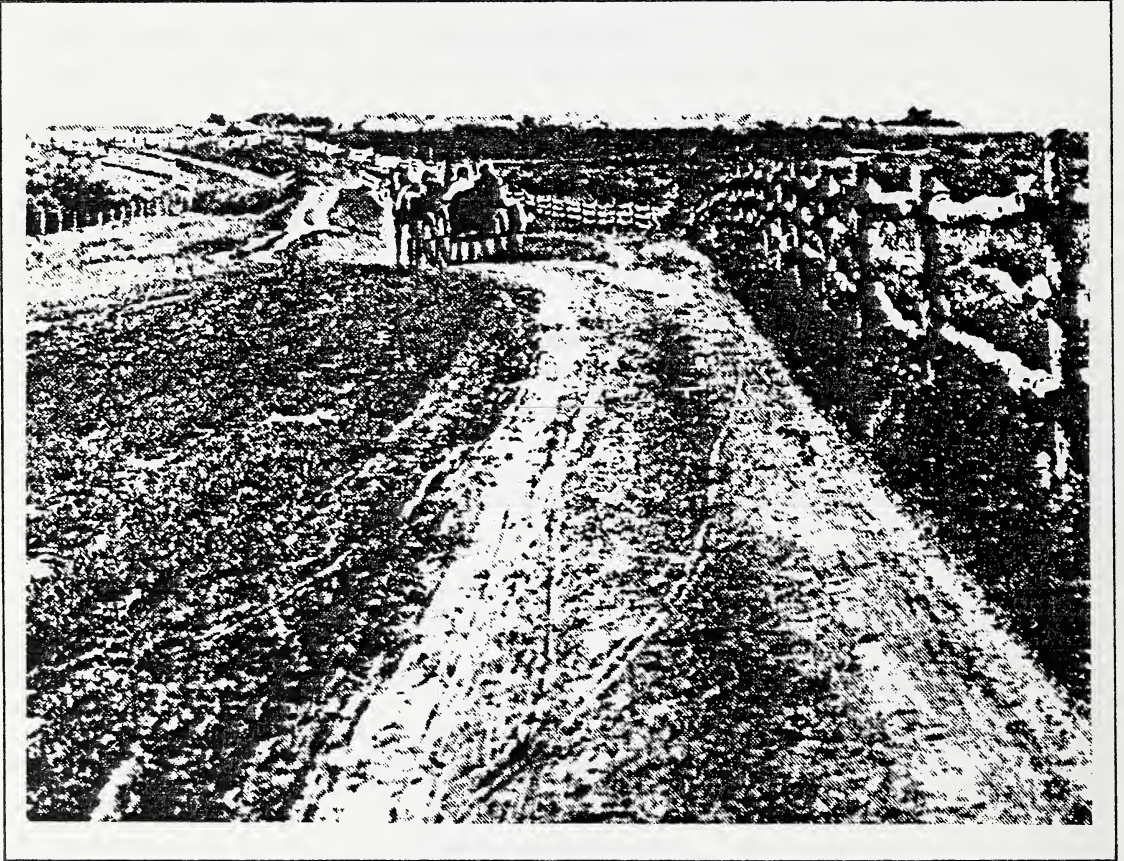
- the list of Alberta agricultural products given on page 2 of this workbook
- asking people in the community for information
- talking to the staff in an Alberta agriculture district office.

- b. List additional livestock or crop production that occurs in your community.

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

FARMING — THEN AND NOW

Agriculture has changed from the time of early settlers in Alberta.



TRAVEL FOR EARLY ALBERTA SETTLERS

Provincial Archives of Alberta: *Pollard Collection P4127*. Reprinted with permission.

CHANGES IN EQUIPMENT

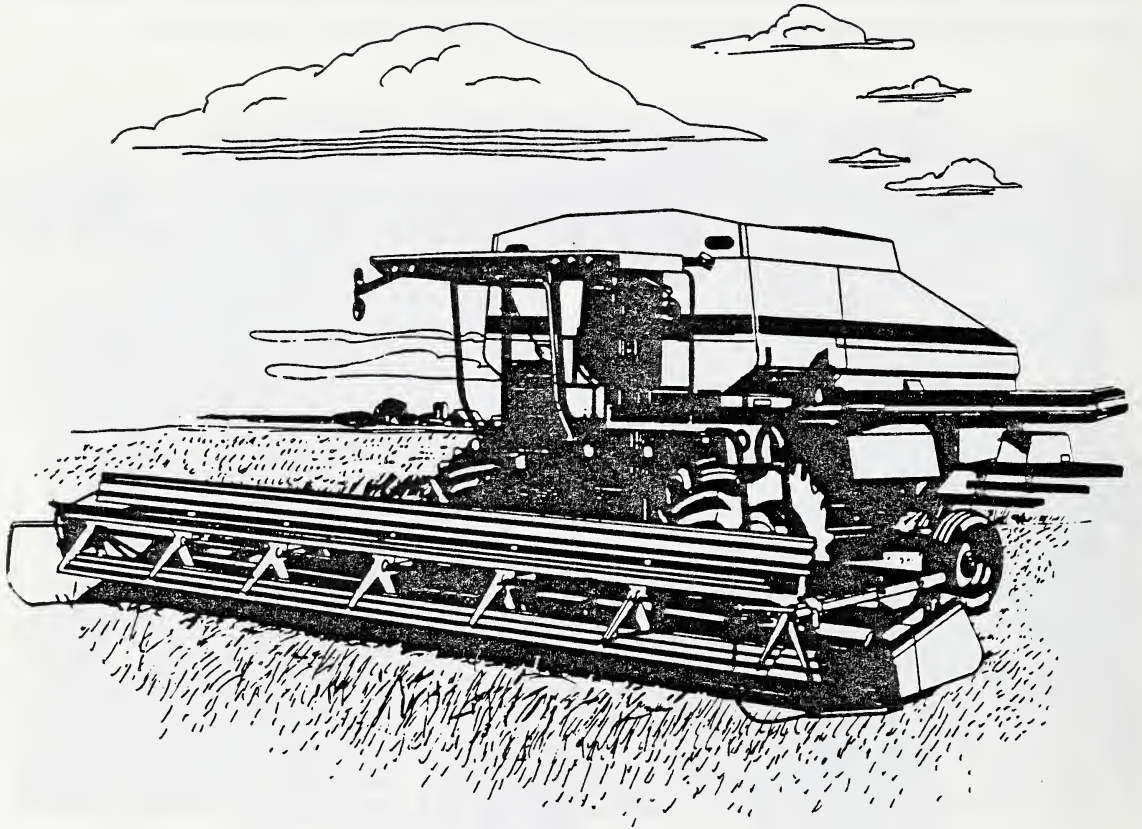
In the earlier days of farming, much of the work was done by hand or with animals. Horses or oxen helped in the field. Farmers swung flails to harvest the crop. The cows were milked by hand. Today, machines such as tractors, combines and milking machines do these same jobs.

The invention of farm machinery and equipment brought about some important changes in agriculture. These machines are always being improved to help the farmer do a better job.



HARVESTING IN 1906

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MODERN HARVESTING

STUDENT ACTIVITIES

1. The two columns below list old and new ways of doing the same job on the farm. Match the old method with a new method. Write the letter corresponding to an old method beside its match in the new method column.

OLD METHOD	NEW METHOD
a. hand milking	_____ combine
b. stooking	_____ swather
c. horses	_____ tractor
d. wagons	_____ milking machine
e. brooding hen	_____ front-end loader
f. flail	_____ baler
g. hand seeding	_____ trucks
h. fork	_____ incubator
i. sickle or scythe	_____ grain dryers
j. sunshine	_____ seed drills
k. cream cans	_____ refrigerated storage tanks

2. The invention of equipment and machinery has changed farming. What equipment or machinery do you think has made the greatest change? Explain your answer.

3. Equipment such as sprayers have replaced traditional methods of applying fertilizer. What are the advantages and disadvantages of using this type of machinery?

Advantages	Disadvantages

JOB SHEET 2

INVESTIGATING ANTIQUE FARM EQUIPMENT

EQUIPMENT, TOOLS AND SUPPLIES

- Pencil

PROCEDURE

1. Visit a museum or a farmer in your area who has a collection of antique farm equipment.
2. Choose two pieces of old farm equipment and answer the following questions.

EQUIPMENT ITEM 1

- What is it called? _____
- What was it used for? _____

- In about what year was it used? _____
- Describe how it was operated by the farmer. _____

- What has taken its place on the farm today? _____

EQUIPMENT ITEM 2

- What is it called? _____
- What was it used for? _____

- In about what year was it used? _____
- Describe how it was operated by the farmer. _____

- What has taken its place on the farm today? _____

POWER SOURCES

All equipment needs some source of power. In the past, the power to operate equipment was supplied by men and animals. Today most of the power to operate equipment is supplied by electricity or fuel.

The chart below shows the sources of farm power.

Power Source	Fuel Used
Humans	Food
Animals	Hay or grain
Steam Engines	Coal, wood, flammable gas or oil
Electrical Motors	Wind, water, coal, flammable gas or oil
Internal Combustion Engines	Gasoline, diesel fuel, compressed flammable gas

At one time, a farmer used a horse and wagon to move grain. The horse was fed hay or grain to produce energy. The horse had a low level of energy and was very slow.

Today, a farmer uses a truck with an engine to move grain. Gas or diesel fuel produces the energy. The truck is much faster than the horse. It can travel many more kilometres on a tank of gas than the horse could on a bag of grain.

STUDENT ACTIVITIES

1. Give some examples of past or present equipment that use human power.

2. Give some examples of animals used for past or present transportation.

3. Name some examples of machines that use steam.

4. What are the sources of electricity in your community?

5. Why do most cars run on fuel instead of electricity?

6. What types of equipment have internal combustion engines?

7. Complete the following chart listing the advantages and disadvantages of various power sources.

Power Source	Advantages	Disadvantages
Humans		
Animals		
Steam		
Electrical		
Internal Combustion Engine		

CHANGES IN FARMING TECHNIQUES

The development of new equipment has brought about many changes in farming techniques.

DAIRY FARMING IN THE EARLY 1900'S

Early in the morning, the farmer milks the cows in the barn. This farm has twelve cows. The first three cows go into their stalls. While they eat, the farmer milks each cow by hand. After these cows are milked, the farmer will milk the other cows in the same way. The milk, now in buckets, is taken to the milk separator, a machine that separates the cream from the milk. This separator is turned by hand. Special cans hold the milk and cream which the farmer will sell. A truck picks up the full cream cans. It takes the cream to a dairy where it is made into butter. The milk will be sold to neighbours or used by the farm family as food for themselves or other animals (e.g., pigs).



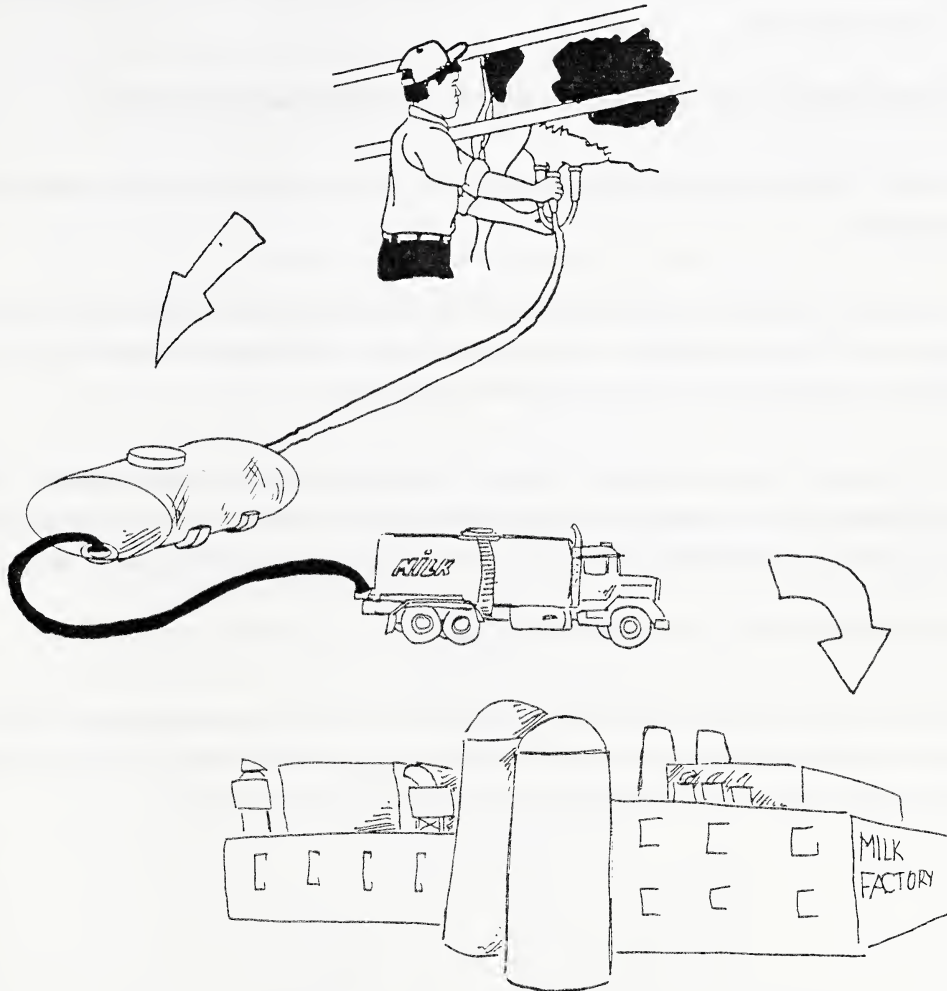
STUDENT ACTIVITIES

1. Complete the following chart to describe the power sources used on the dairy farm in the early 1900's.

Dairy Farm Tasks	Power Source
1. Feed the cows	Human power
2. Milk the cows	
3. Separate the milk	
4. Transport the cream	

DAIRY FARMING TODAY

The following picture shows the process of milking a cow on a modern dairy farm.



STUDENT ACTIVITIES

1. Dairy farming today involves the use of many types of equipment and machinery and more forms of power. How have these factors changed dairy farming?

CHANGES IN KNOWLEDGE

Over the years, technology has advanced and farmers have learned more about farming and the products they grow. As knowledge increases, agriculture changes. Also, scientists have made many discoveries that have changed agriculture. They have worked with and for farmers to develop better products for the farmer to use.

Following is a list of changes in farming that have resulted from discoveries and inventions.

- Scientists have developed seed varieties that will grow well in Alberta's climate, and short growing season.
- Soil scientists have learned how to tell what is in the soil and what affects the growing of plants. The farmer can use this knowledge to grow better crops. Also, special fertilizers have been developed for different types of soils and different types of crops.
- At one time farmers' crops were always in danger of being destroyed by bugs or diseases. The discovery of pesticides and herbicides to control these bugs and weeds has been an important change in agriculture. These chemicals must be used carefully to prevent environmental damage.
- Drugs and treatments are now available for the prevention or cure of many animal diseases.
- At one time, much of the food a farmer produced had to be eaten very quickly so that it didn't spoil. The invention of refrigeration meant that food could be stored safely for a longer time. Special techniques such as milk pasteurization made food safer for people to eat.

STUDENT ACTIVITIES

1. a. Break into small groups of three or four students and brainstorm the changes in agricultural knowledge. Have one member of the group act as timekeeper and give yourselves ten minutes to record as many as possible.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- Share the list with the class.
- Add items to your list from the other groups' lists.

CHANGES IN TRANSPORTATION

Products from the farm must be transported to the marketplace. Improvements in transportation have brought about major changes in agriculture.

Better transportation means that food can be moved faster and arrive fresher than it was before. It also means that a greater variety and quantity can be moved at one time.

STUDENT ACTIVITIES

1. How has transportation changed in your community? How do the following differ today from fifty years ago? What effects have these changes had on agricultural production?

- ROADS

- TRAINS

- ROAD VEHICLES

- FARM EQUIPMENT

WHY DO THINGS CHANGE?

Technology uses knowledge from science to improve the ways in which work is done. Many of the changes in agriculture are due to modern technology. Changes in technology continue to change agriculture and its related businesses.

Technological improvements include inventing better ways of doing things. Manufacturers find faster ways to make equipment and tools. Scientists experiment with new ways to grow farm products. Farmers experiment and use the new ideas on their farms. They use modern equipment and the latest in technological developments to improve their products.



Farmers use an airplane to spread chemicals during crop dusting.

JOB SHEET 3

INVESTIGATING CHANGES CAUSED BY TECHNOLOGY

EQUIPMENT, TOOLS AND SUPPLIES

- Pencil

PROCEDURE

1. Talk to a farmer or an early settler in your community about farming in the early days.
2. Use the following questions as a guide to find out how technological changes have affected the farmer.
3. Record the responses.

- Why did farmers stop using horses for field work and start using tractors?

- How did the invention of the telephone change the farm?

- How do farmers make use of electricity?

- Why are chemicals important to the farmer?

- How are computers used in farming?

- How does the farmer learn about new technologies?

4. Record any other information you have learned about changes in agriculture.

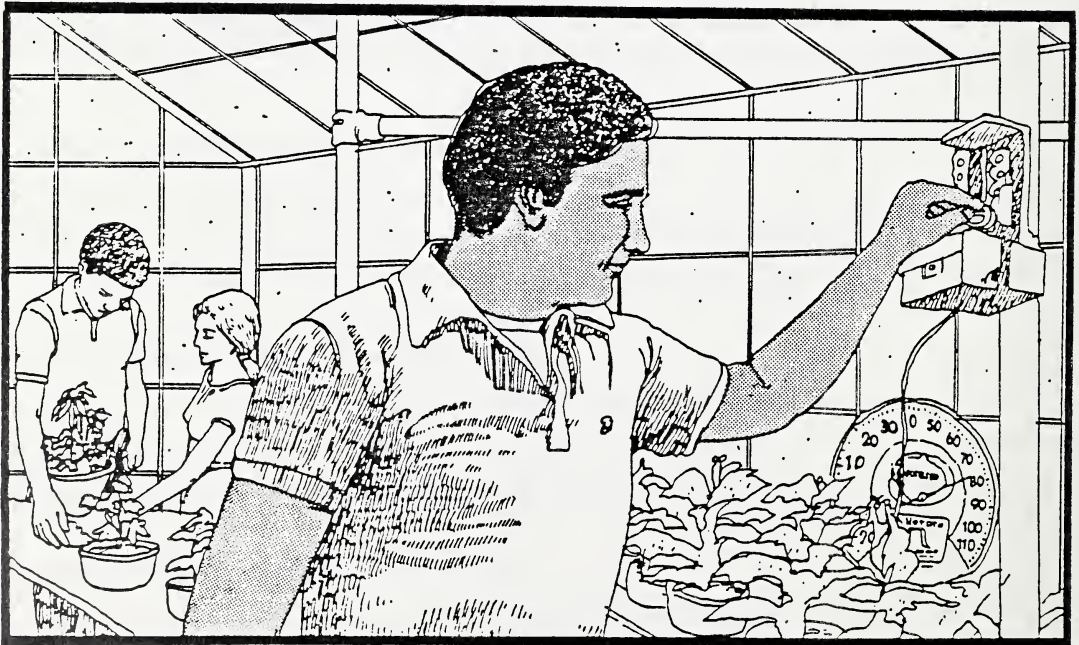
5. What are the advantages and disadvantages of these changes in technology?

Advantages	Disadvantages

HOW CHANGES AFFECT PRODUCTION

Changes in agriculture have affected production. Production is the amount a farmer can grow. A farmer can grow more today because:

- machinery allows the work to be done faster than when the same work was done by hand
- machinery helps a farmer to farm more land
- special chemicals protect the crop and make the soil better for growing crops
- improved barns and equipment allow the farmer to raise more animals
- many people are involved in research to improve farming and provide information that helps the farmer know more about production.



STUDENT ACTIVITIES

1. Explain why each of the following statements is true. Give an example for each explanation. You may use a variety of resources to assist you, including reference books, farm magazines, interviews with farmers and district agriculturalists.

- Today, a farmer can grow more barley, oats or wheat on one hectare of land than a farmer could fifty years ago.

- Today, one man can farm more hectares of land than his father was able to keep under cultivation.

- Today, a dairy farmer can milk more cows than ever before in the history of milk production.

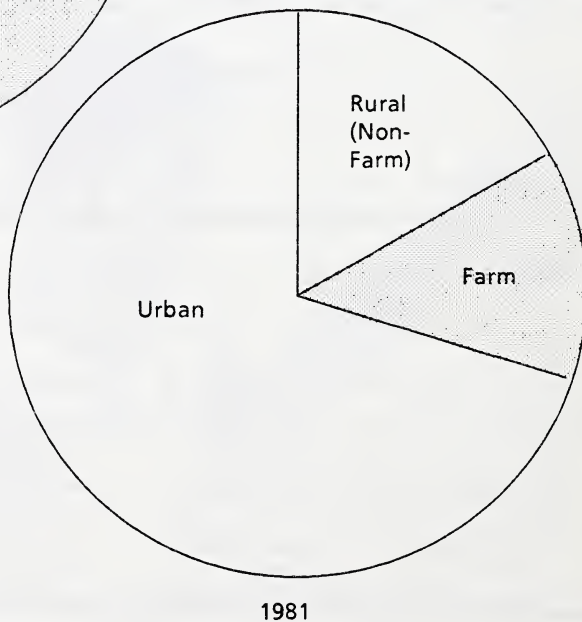
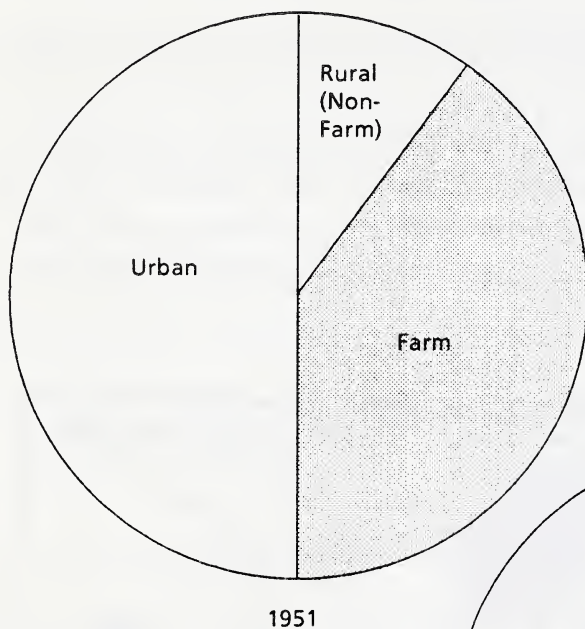
- Today, herds of cattle increase rapidly because fewer newborn calves die.

- Today, using modern technology, a poultry producer can raise more chickens than in the past.

HOW CHANGES AFFECT POPULATION

Farmers make up a lower percentage of the population of Alberta today than they did forty years ago. One reason for this change is that each farmer is able to produce more food and work more land than ever before.

The following graphs illustrate the movement of Albertans to cities and towns.



CHANGES IN FOOD PROCESSING

Many of the changes in agriculture affect the food we eat. Changes in the way farm products are processed or prepared for sale have provided better quality, quantity and variety of sales items. Examples of these changes are described below.

- Pasteurization makes milk safer by destroying harmful bacteria.
- Refrigerated transportation prevents vegetables from spoiling before they get to the store.
- Refrigerated display units in grocery stores keep milk and meat products fresh.
- Better packaging techniques allow products such as cheese to be transported and stored more easily and more safely.

Because of better transportation and storage, there is a greater variety of food in the grocery store than ever before. Many foods are now available year-round and do not have to be eaten when they are first grown or when they are 'in season'.

STUDENT ACTIVITIES

1. What other changes have occurred in food processing?

2. Which seasonal foods are available at 'out of season' times in your community? Where do they come from?

FOOD INDUSTRY FLOW CHART

WHAT IS A FLOW CHART?

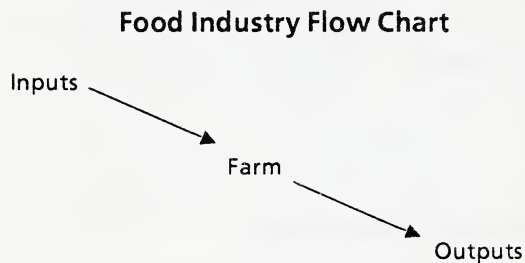
A flow chart shows how one task relates and leads to another. A food industry flow chart is a way of showing how the work of one group of people helps another group of people. It shows how the job of one person depends on the jobs of other people.

The parts of a flow chart are called inputs and outputs.

INPUTS are what a farmer uses in production.

OUTPUTS are the products the farmer supplies.

A **FOOD INDUSTRY FLOW CHART** displays the inputs needed by the farmer to produce food, and the outputs of farming that result in the food on store shelves.



STUDENT ACTIVITIES

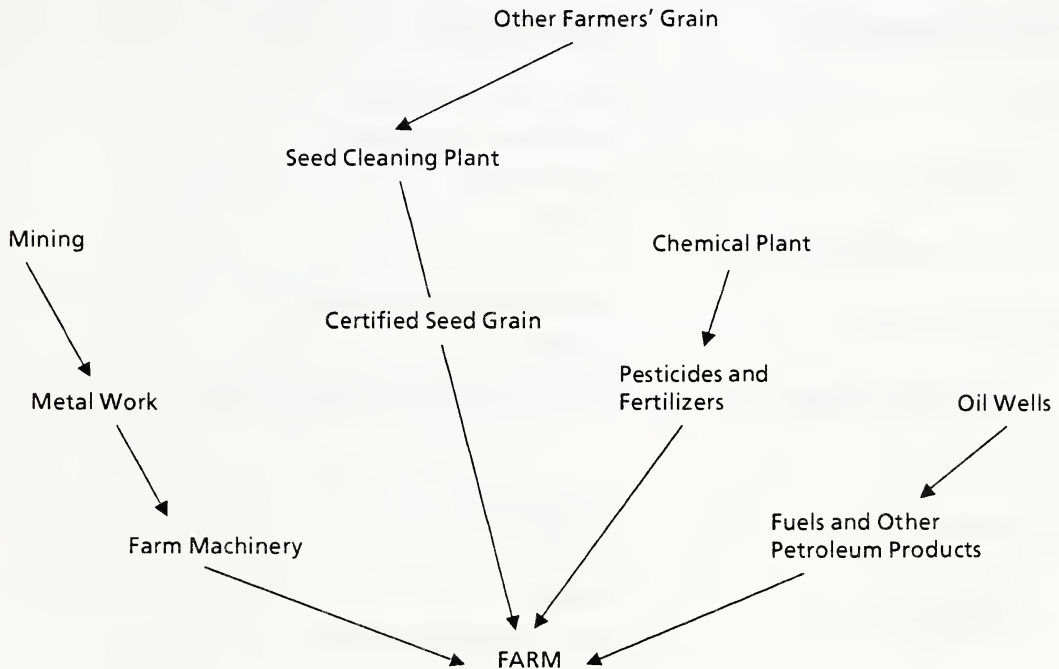
1. List ten input items used on a farm.

2. List ten output items that could be produced on a farm.

USING A FLOW CHART

To read a flow chart, simply follow the arrows.

INPUTS FOR A GRAIN FARMER



Following the arrows in the flow chart provides the following information.

- Farmers supply the seed cleaning plant with grain. The plant cleans the grain and sells it to other farmers to use as seed.
- The products of mining are used in the metal work industry to build farm machinery which is purchased by the farmer.
- Chemical plants make fertilizers and pesticides which the farmer uses in growing and maintaining a crop.
- Oil wells provide petroleum products which the farmer uses to run machinery.

A flow chart can also be a guide for generating career ideas. The following example shows how sections of the flow chart, **INPUTS FOR A GRAIN FARMER**, can be used to explore jobs that depend on farming.

SECTION OF FLOW CHART

Mining



Metalwork



Farm Machinery

Other Farmers' Grain



Seed Cleaning Plant

Chemical Plants



Pesticides and
Fertilizers

Oil Wells



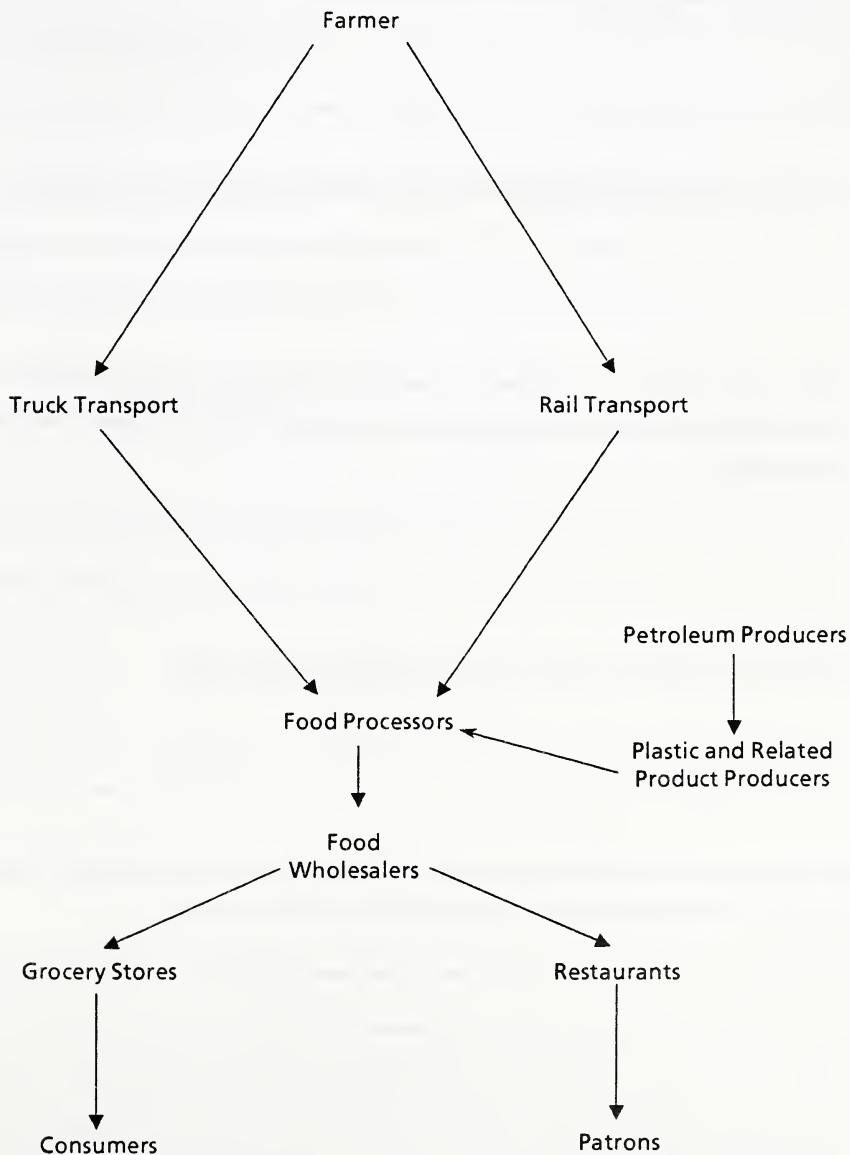
Petroleum Products

POSSIBLE CAREERS

- farm machinery dealer
- machinery repair person
- metalworker
- miner
- seed cleaning plant operator
- trucker
- plant maintenance person
- salesperson
- chemist
- trucker
- plant maintenance worker
- trucker
- oil rig employee
- service station attendant
- bookkeeper

The second part of a food industry flow chart displays what happens to the outputs of the farmer. Outputs are the items the farmer produces. The output flow chart shows how these products move from the farmer to the table.

OUTPUTS FOR A GRAIN FARMER



STUDENT ACTIVITIES

1. Use the flow chart, Outputs for a Grain Farmer, to answer the following questions. The answers to these questions will explain the flow chart for outputs of the grain farmer.

- How does the grain get to the food processors?

- How are petroleum products used in the processing of the farmer's product?

- Once grain is ground into flour by the food processors, it must go through another step on the chart before it can become spaghetti or bread. What is this step? Describe what happens at this step.

- Where does a grocery store or restaurant get the food it sells?

2. As a class, discuss the careers that are part of the outputs for a grain farmer's flow chart. After the discussion, list the jobs/careers in the area that most interest you.

3. Choose a food that you like to eat. Draw a flow chart to show how you think the food gets from the farm to you.

FOOD CHAINS

All living things require energy to survive. This energy can come in different forms. The primary source of energy on earth is sunlight. The sun's energy is called solar energy. All other forms of energy are related to solar energy.

The food chain is the result of solar energy being changed from one form of energy to another. The result of these changes is that people can use the sun's energy to grow things for food. In turn, this food is used to give people energy.

FLOW CHART OF THE FOOD CHAIN

SOLAR ENERGY

GREEN PLANTS

PLANT EATING ANIMALS

HUMAN BEINGS

- Through photosynthesis, a plant uses solar energy to manufacture food for itself. The plant uses this food to grow.
- When an animal eats a plant, the plant fibre becomes protein. Some animals are then used as food by people.
- Human beings can also use the energy plants produce by eating plants for food.

PEOPLE AND THE FOOD CHAIN

People get energy through two food sources, plants and animals. When human beings eat, they become part of the food chain.

Many people, especially farmers, have another role in the food chain. Through agriculture, the farmer produces the plants and animals that are part of the food chain.

The following chart shows how a farmer's work helps each link in the food chain.

Food Chain	Farm Activity
Green Plants	<ul style="list-style-type: none">- seeding- cultivation- irrigation- fertilization- weed and pest control- harvesting
Plant Eating Animals	<ul style="list-style-type: none">- feeding and watering- disease control- animal care- breeding
Human Beings	<ul style="list-style-type: none">- food gathering (milking, egg collection)- marketing animals

PRODUCERS AND CONSUMERS

There are many people involved in the food chain. These people form two groups, producers and consumers.

A **PRODUCER** is the person who makes, grows or provides something.

Examples: farmer, manufacturer

A **PROCESSOR** is a person who changes a food item to make it more useable or saleable.

Examples: butcher, miller

A **product** is the item or service provided by the producer or processor.

Examples: wheat, flour, food containers

A **CONSUMER** is the person who uses the product.

Examples: flour mill, you



THEREFORE: A farmer is a **PRODUCER** of hogs.
A butcher cuts the hog and packages the meat.
The hog is a **PRODUCT** provided by the farmer.
The bacon is eaten by the **CONSUMER**.

A STORY OF PRODUCERS AND CONSUMERS

When I raise sheep I am a producer of two products; wool and meat.

If I manufacture wool yarn, I am both a processor and a consumer. I am a consumer of wool because I must first buy the wool. I am a producer of yarn that I sell.

If I manufacture wool mittens, then I am a consumer of wool yarn, which I must first buy, and I am a producer of mittens, that I sell.

If I buy and wear wool mittens, I am a consumer.

STUDENT ACTIVITIES

1. Discuss in class how it is possible to be both a consumer and a producer.

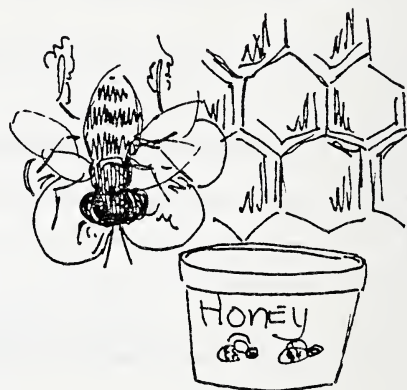
2. Give some examples of producers.

3. Give some examples of processors.

4. Give some examples of consumers.

5. Give some examples of products.

The illustrations on this page show some agriculture products that are produced and consumed in Alberta. They also show how these products may look after processing.



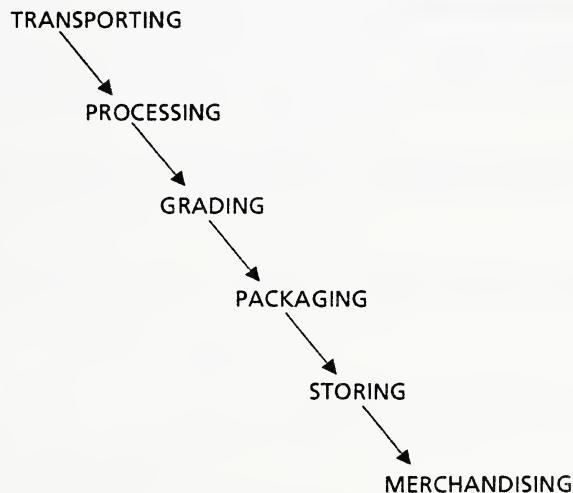
FOOD PRODUCTION

Once the farmer grows a product, it is usually moved and processed, so that it can be used by the consumer. There are a number of steps involved between the producer and the consumer. The following is an example of these steps for a wheat farmer's product.

The farmer grows wheat and TRANSPORTS it to the grain elevator. The wheat is GRADED for quality and then transported to a flour mill. The flour mill PROCESSES the wheat into flour. The flour is then PACKAGED in bags or boxes. These may be STORED in a warehouse at the flour mill or a grocery store. Finally, the store sells the flour to the consumer. This last step is sometimes called MERCHANDISING because a product has been bought and sold.

The following flow chart shows the steps used to move products from the producer to the consumer.

GRAIN TO FLOUR



Each step creates employment for people. However, some of the steps in moving a product between producer and consumer may happen more than once or not happen at all. For some products:

- some of the steps do not happen
- the steps do not always happen in the same order
- the steps involved depend on the product.

STUDENT ACTIVITIES

1. The flow chart on the previous page shows the steps a product may follow to get from the farm to the consumer. Below are definitions of each of these steps. Match each step with the definition given below.

DEFINITION	STEP DESCRIBED
● Moving products from one place to another.	_____
● Identifying the quality of a product.	_____
● Changing a product and making it useful for a specific purpose.	_____
● Bundling or wrapping a product.	_____
● Keeping a product for future use.	_____
● Buying, selling or promoting the use of a product.	_____

2. a. As a class, research and discuss each of the steps used to bring milk from the dairy to the breakfast table. To assist your research, visit a dairy operation and/or invite a dairy farmer or the manager of a dairy processing plant to your classroom.

b. After your discussion, give a brief description of each of the following steps.

● Transporting: _____

● Grading: _____

● Processing: _____

● Packaging: _____

● Storing: _____

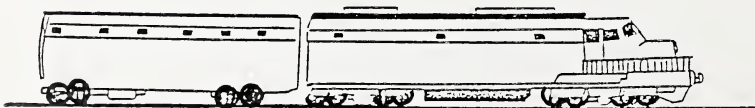
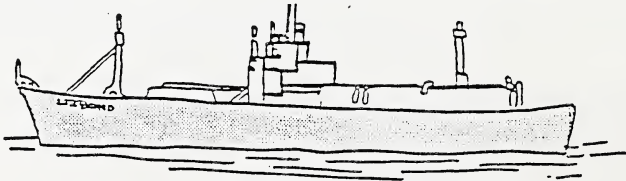
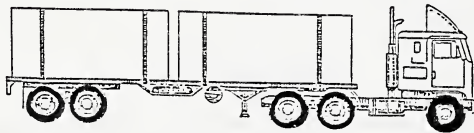
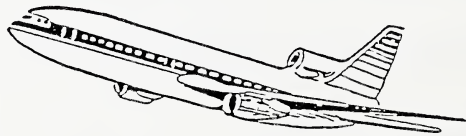
● Merchandising: _____

TRANSPORTING

In the 'Grain to Flour' example on page 41, the product was transported five times:

- from the farm to the grain elevator
- from the elevator to the flour mill
- from the flour mill to the warehouse
- from the warehouse to the grocery store
- from the grocery store to the consumer's home.

Transportation can be by truck, train, ship or airplane. Some products are transported many miles. For example, some Alberta agricultural products are used in other countries. Other products go only a short distance. For example, sometimes a product is taken only as far as the closest town.



STUDENT ACTIVITIES

1. List several jobs that are part of the transportation step.

2. List the ways that agricultural products may be transported.

GRADING

In the 'Grain to Flour' example, the grain was graded at the elevator to determine its quality. Grading determined whether the grain was good enough to be made into flour and how much the farmer would be paid for the grain.

Some products, such as vegetables and eggs, are sold to the consumer by grade. The grade is stamped on the package. For example, you might buy either Grade A or Grade B eggs. Grade A eggs are a better quality than Grade B eggs.

STUDENT ACTIVITIES

1. Visit a grocery store and find five products with a grade stamped on them. In the following spaces, list the products and the grade indicated on each.

Product	Grade

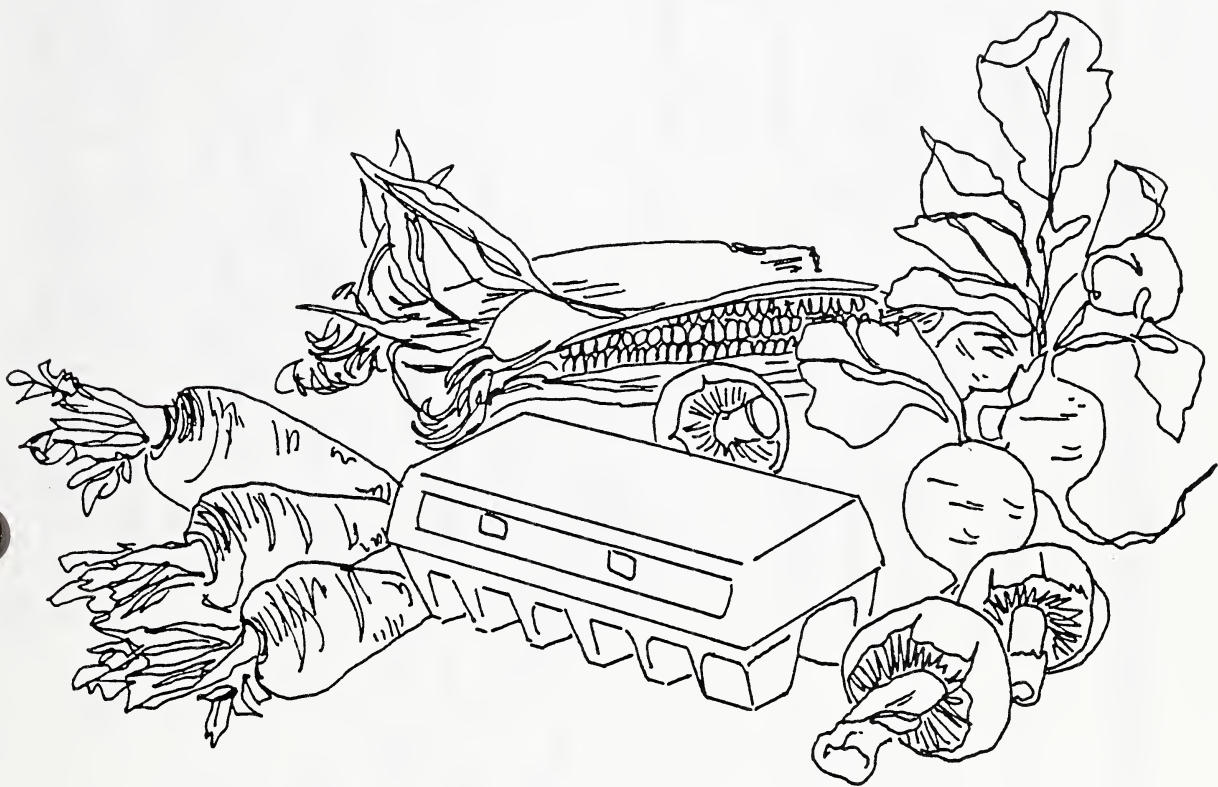
2. a. Brainstorm: What qualities or features may be used to grade agricultural products?
- b. List at least three agricultural products that are graded and two qualities or features of each.
-
-
-
-
-

PROCESSING

Processing changes a product from one form to another. In the 'Grain to Flour' example, the wheat must be processed into flour so that it can be used by consumers. It could be further processed to make spaghetti, macaroni, cake mixes or pancake flour.

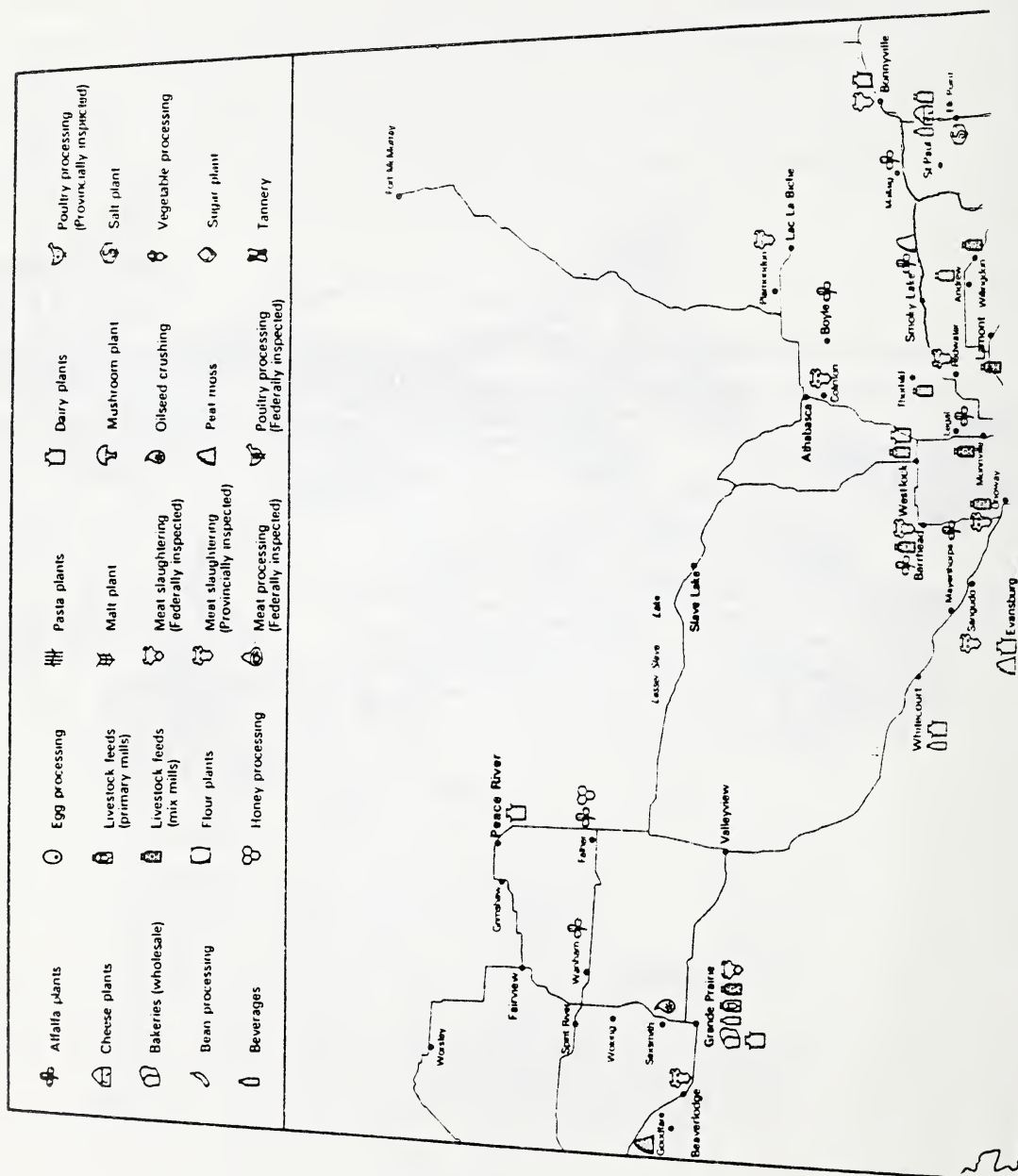


Some products, such as eggs, fresh fruits and vegetables can be used by humans without processing.



Processing creates many jobs in our province. The maps on the following two pages show the processing industries in Alberta.

ALBERTA AGRICULTURAL PROCESSING INDUSTRIES





Map from *Pride in Alberta: A Teacher's Handbook on the Agriculture Industry* by B. Gabert.
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STUDENT ACTIVITIES

1. As a group of two or three students, research an agricultural product that is processed and answer the following questions.

- Product name _____
- How is the product processed? _____

- Where does processing take place? _____

2. a. Study the Alberta Agricultural Processing Industries map (pp. 48-49) and find the location of your community.

b. Use a compass to draw a circle, representing a 100 km diameter, around your community location.

c. List the processing industries within this circle.

PACKAGING

Many products are packaged in a processing plant.

Some products are packaged more than once. For example, in a box of margarine, each block of margarine is individually wrapped and then boxed.

Jobs in the packaging industry include making the packages (e.g., plastic containers, metal cans and paper products) and print labels.

Products are packaged for three important reasons.

- **SANITATION**

Some packaging protects the product from germs, dirt and any other foreign particles that might come in contact with the food. Packaging helps to keep the food clean. Food needs some protection for its storage on the grocery store shelves.

Examples: Milk cartons

Wrapped meats

Canned vegetables

Packaged cheese



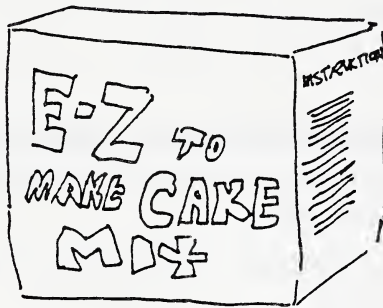
- **INFORMATION**

Packaging may also be used to inform the consumer about the contents and use of the product. Packages may list the 'best used before date' for the product, the ingredients that are in the product, the weight of the contents, and the price.

Examples: Pictures and names on food packages

Recipes or instructions on pancake mixes

The weight and price on meat

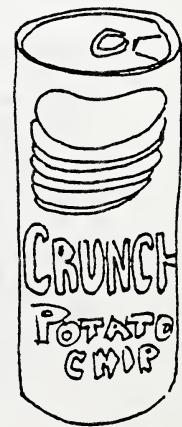


- **ADVERTISING**

Packaging may also be a form of advertising. An attractive package is designed to encourage the consumer to buy the product.

Examples: Coloured picture on a pizza mix

An unusual shape such as a can of potato chips



STUDENT ACTIVITIES

1. Carefully study five different food packages. Use the information from these packages to complete the following chart. Remember that a package may have more than one purpose.

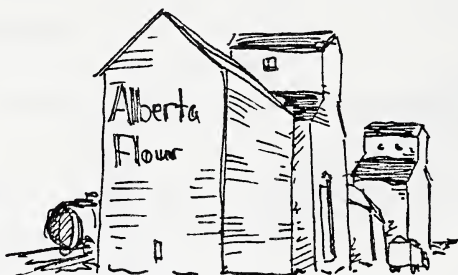
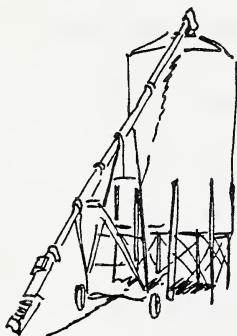
Name of Food	Purpose of Package	Information on Package

2. What jobs could be found in the packaging industry?

STORING

Products can be stored several times as they move from farm producer to consumer. For example:

- a. The farmer stores the grain in his granary.
- b. The elevator company stores the grain before it is transported to a processor.
- c. The flour mill may store the grain both before and after processing.
- d. The grocery store stores the flour until it is sold.



STUDENT ACTIVITIES

1. Select an agricultural product other than grain. List the stages and locations where the product may be stored on its journey to the consumer.

MERCHANDISING

En route or in transit from the farm to the consumer's kitchen, a product is bought and sold several times. Merchandising involves the buying and selling of a product. Merchandising is a big part of the food industry in Alberta.

Some of the jobs in merchandising include salesperson, caretaker, shelf stocker, manager, food tester and developer and product promoter.

STUDENT ACTIVITIES

1. List some examples of merchandising involved in agriculture; e.g., the grain elevator company purchases the grain from the farmer.

2. Why does the price usually increase every time a product is bought and sold?

ADVERTISING

Advertising is part of the merchandising step. It is used to tell consumers about the products available. Advertising may be used by producers, processors or merchandisers to promote their products to the consumer.

Advertising by Producers

A farm producer group may use advertising to encourage people to use their products. You may have seen milk advertised on television. If an advertisement is sponsored by a producer group, that group will be identified. For example, at the end of the advertisement promoting milk, you will see 'Sponsored by the Dairy Producers of Alberta'.

STUDENT ACTIVITIES

1. Make a list of at least two radio and television advertisements that encourage people to use Alberta agricultural products.

2. Select one agricultural product advertisement that is sponsored by producers. Is the advertisement effective? Why or why not?

Product Name: _____

Effectiveness: _____

Why/Why not?: _____

Advertising by Processors

Advertising may also be used by food processors to inform consumers about their products.

STUDENT ACTIVITIES

1. Locate one example of an advertisement from a food processor and attach it or a copy to this page.

Advertising in Merchandising

Advertising may be used by a grocery store to inform consumers of special food prices. Sometimes items are sold at a lower than usual price; these are called sale items. Some forms of merchandise advertising include brochures, flyers and posters.

STUDENT ACTIVITIES

1.
 - a. Check the local newspapers and other publications to locate merchants' advertisements of agricultural products.
 - b. Make a collection of this type of advertising.
 - c. Display the collection; e.g., make a poster or scrapbook.
2.
 - a. Complete the chart below for one type of agricultural product advertised by several merchants.
 - b. Compare the prices of similar items listed in more than one advertisement.

Item Name _____		
Merchant's Name	Size/Quantity of Product	Price

LAND AS A RESOURCE

The land on which people live and work is a natural resource.

A NATURAL thing is something that exists in nature or is produced by nature.

A RESOURCE is a supply or source.

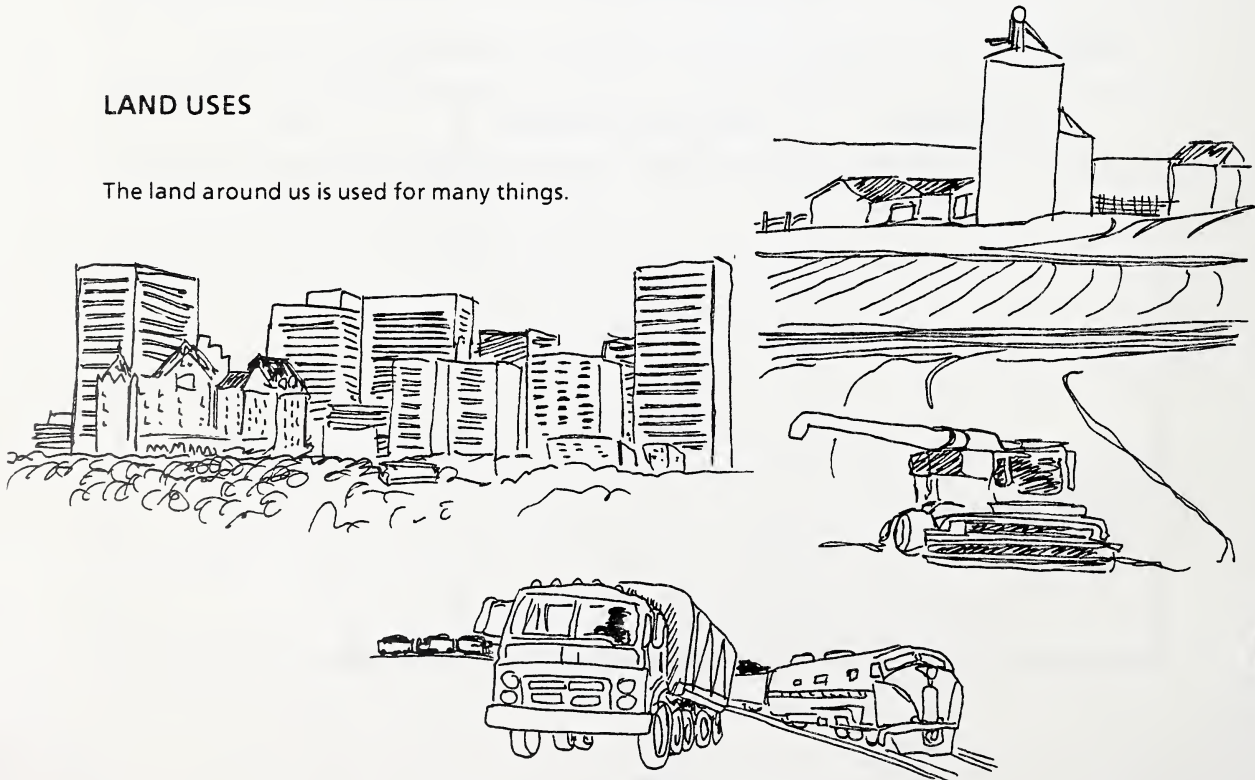
STUDENT ACTIVITIES

1. Why is land called a natural resource?

2. Name some other natural resources.

LAND USES

The land around us is used for many things.



STUDENT ACTIVITIES

1. List five uses for land.

2. Discuss the list with classmates. List new uses learned from the discussion.

LAND IS USED FOR . . .

- **URBAN DEVELOPMENT** – Cities, towns, and villages are areas that people need in order to have a place to live, carry out business and go to school.
- **AGRICULTURE** – Areas used for farming is referred to as agricultural land.
- **FORESTRY** – Regions set aside for growing trees are used to produce a variety of products such as wood for building and paper for books.
- **MINING** – Areas under the land can provide many materials such as coal, potash or gold.
- **WILDLIFE** – Many animals share the land with man. Sometimes special wildlife reserves are set up as areas of protection for wild animals and birds.
- **TRANSPORTATION** – Highways, railroads and airports require land space.
- **WATER** – The surfaces covered by lakes, streams and man-made water storage units such as dugouts account for some of the land use in any given area.

- **RECREATION** – The land space used by people for leisure activities is called recreational usage. Parks and golf courses are examples of land used for recreation.
- **INDUSTRY** – Factories, oil refineries and stores require land space.

STUDENT ACTIVITIES

1. Sketch a map of your county or district. Then indicate the areas of land usage.

LAND OWNERSHIP

Land is owned when a person buys or receives the land title. Land titles are ownership papers used to identify the owner and the location of the property.

Land can be owned by one person, a family, a group or a community. Companies can also own land. Land owned by the government is called **Crown land**.

Land can also be rented by one person or group from the owner(s). This form of renting is known as **leasing the land**.

Land can also be owned and operated by two industries. For example, mining and farming can occur together on the same piece of land. The farmer may own the top of the land (**surface rights**) while some company may lease the underground (**mineral rights**) for oil or natural gas drilling.

STUDENT ACTIVITIES

1. Give an example of each type of land ownership in your community. The name of the family, company or farm may be used, or the location of an area of land may be used.

- Individual ownership

- Community ownership

- Government ownership

- Company ownership

- Leased land

- Land being used for more than one purpose

SOIL FEATURES

Soil begins as rock. Over a very long period of time, weather breaks down rock into sand. The action of weather conditions such as hot and cold temperatures, moving water and wind continue to break down the sand.

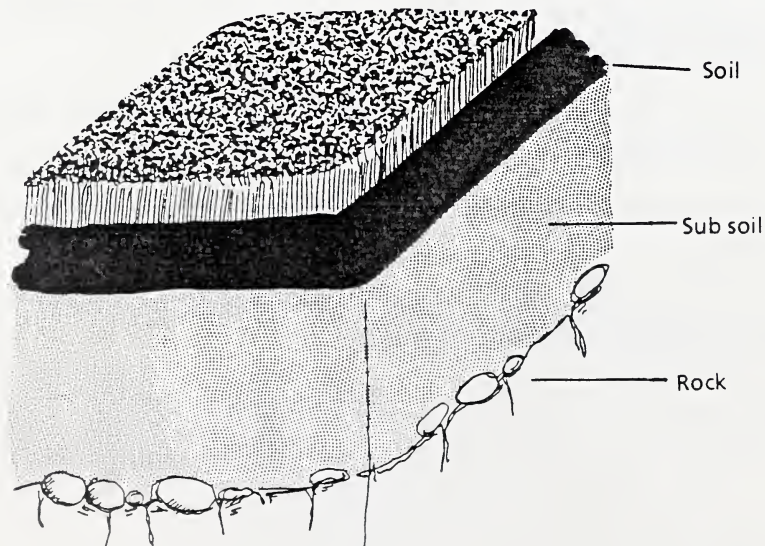
Sand needs to contain other things before plants can grow in it. The soil must be fertile. This means that it must allow for the growth of plants; it must be productive. Nutrients, air and moisture are needed to make fertile soil.

Animals such as earthworms help to create fertile soil. The wastes that earthworms leave behind after digesting decayed plants are added to the soil. Earthworms also make holes for air and water to get into the soil. Finally, as earthworms move through the soil, they help loosen it so that the roots of a plant can grow.

The soil is also made up of many other tiny animals and plants. Some of these can only be seen through a microscope because they are so small. All of them are important to the fertility of the soil because they add the nutrients and moisture needed.

SOIL LAYERS

The ground is made of three layers: **topsoil**, **subsoil**, and **parent material**.

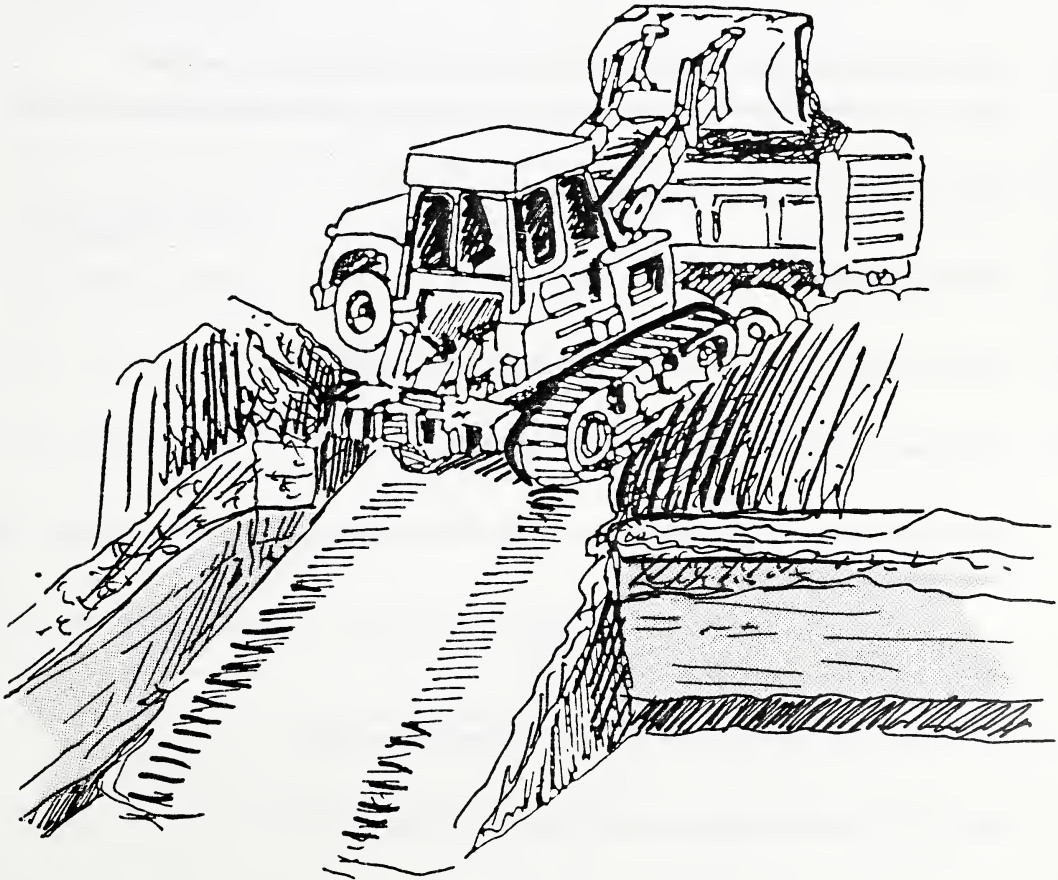


Plants grow best in **topsoil** because the soil has been thoroughly broken down. Good topsoil contains nutrients, air and moisture.

The **subsoil** is a mixture of soil and rocks. It does not contain as many nutrients for plants.

The **parent material** is rock. Through weathering, this rock can become soil but it takes a very long time – millions of years. Parent material contains very little air, moisture or nutrients.

Sometimes these layers can be seen at excavation sites where the top layers of soil have been removed.



JOB SHEET 4

TESTING SOIL FERTILITY

EQUIPMENT, TOOLS AND SUPPLIES

- Shovel
- Hand trowel
- Watering can
- Pencil
- Labels, 3
- Flowerpots, 3
- Bean seeds, 12

PROCEDURE

1. Collect samples of topsoil, subsoil and parent material from a ditch or riverbank.
Note: If the parent material cannot be easily reached, small, clean rocks can be used instead.
2. Crush the topsoil and subsoil samples as finely as possible.
3. Fill each flowerpot with one type of sample material.
4. Lightly tamp the surface of the samples to provide a firm seed bed.
5. Plant four seeds in each flowerpot about 3 cm deep.
6. Gently pour water over the samples until the water begins to drain from the holes in the bottom of the container.
7. Store the pots in a warm, well lighted place.
8. Record the planting date on the chart at the end of this Job Sheet.
9. Water the flowerpots regularly to keep the surface of the soil moist.
10. Record the results of this experiment for two months.

11. Dispose of the samples and plants as recommended.
12. Clean and return all equipment, tools and supplies to their proper storage areas.
13. Clean up the work area.
14. Complete the following chart.

	Topsoil	Subsoil	Parent Material
Date planted			
Dates plants emerged			
Number of plants showing			
Which plants looked healthiest: <ul style="list-style-type: none"> ● after two weeks? ● after one month? ● after two months? 			

15. Answer the following questions.

- What did you and your classmates learn from completing this job sheet?

- Why did some plants grow better than others?

- How does the type of soil used affect the growth of plants?

SOIL STRUCTURE

Plant growth occurs in topsoil, the soil on the surface of the land. Topsoil is made up of three types of soil — sand, clay and silt. As well, topsoil contains plant and animal particles known as organic matter.

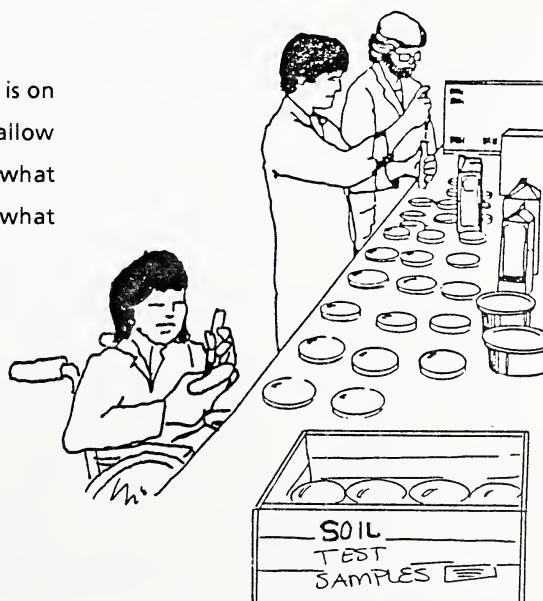
There are different types of topsoil because soil from different areas can contain different amounts of sand, clay and silt. Loam is the word used to describe soil which has approximately equal amounts of sand, clay and silt.

Sand is really the beginning of soil. It is actually very tiny rocks. Silt consists of smaller particles. Clay is made of the smallest particles. The size of the particles affects the speed of water drainage, heat travel and air travel through the soil. These conditions will affect the growing ability of the soil. This means that the structure of the soil affects the ability of the soil to grow plants.

The type of soil is very important to the farmer. The amount and mixture of sand, silt and clay in the soil will affect:

- how well the plants grow
- the amount of fertilizer needed
- the amount of tillage or cultivation needed to prepare the land
- the erosion that might occur.

A farmer needs to know what type of soil is on the land to be farmed. Knowing this will allow the farmer to make wise decisions about what plants would be the best to grow and what care is needed for the plants.



STUDENT ACTIVITIES

Using a variety of resources (e.g., contacting the local Alberta agriculture consultant) answer the following questions.

1. What type of soil is common in your area?

2. How is this soil type recognized?

3. What is the best type of soil for growing most agricultural products?

4. How is the best type of soil identified?

JOB SHEET 5

IDENTIFYING SOIL STRUCTURE

EQUIPMENT, TOOLS AND SUPPLIES

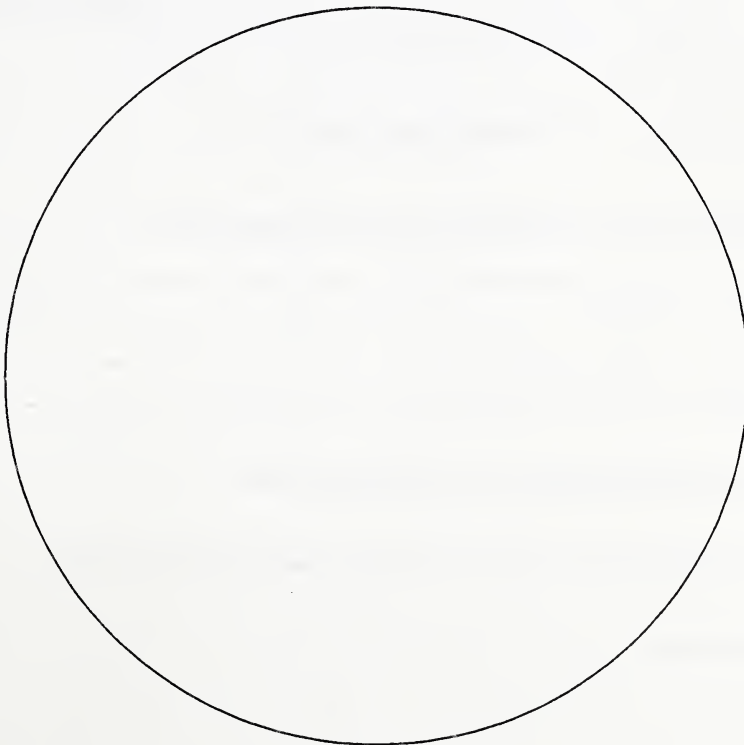
- Magnifying glass
- Soil samples, 2

PROCEDURE

Note: The structure of soil is determined by the size of the soil particles, their shape and their arrangement. In between the particles of soil are both air and water.

1. Obtain a small sample of topsoil without breaking it into pieces.
2. Use the magnifying glass to look at one side of the soil sample.
3. Draw a picture of what you see. Label what you draw.

SAMPLE
ONE



4. Repeat the procedure with a different soil sample from another area.

SAMPLE
TWO



5. Describe the differences that were observed between the two samples.

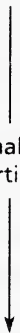
6. Dispose of the samples as directed by your teacher/supervisor.
7. Clean and return all equipment, tools and supplies to their proper storage areas.
8. Clean up the work area.

SOIL TEXTURE

Most soils are made of **mineral matter** and **organic matter**. For example, a garden soil might contain 95% mineral and 5% organic matter.

The mineral matter consists of:

- rocks
- gravel
- sand
- silt
- clay.



smaller
particles

The organic matter consists of:

- dead plants
- dead animals.

JOB SHEET 6

SEPARATING SOIL COMPONENTS

EQUIPMENT, TOOLS AND SUPPLIES

- Shovel
- Pail
- Jar with a secure lid
- Detergent (non-foaming)
- Water
- Newspaper

PROCEDURE

1. Collect a topsoil sample from a garden or field site.
 - a. Remove loose debris from the surface area.
 - b. Dig up one shovel full of sample and place it in a pail.
 - c. Take the sample inside and spread it out on a newspaper.
2. Allow the sample to dry thoroughly.
3. Crush the sample by hand to remove all lumps.
4. Remove all rocks, roots and other debris.
5. Thoroughly mix the sample.
6. Fill the jar one-quarter full with the sample.
7. Add enough water to fill the jar threequarters full.
8. Add 15 mL of detergent.
9. Secure the lid on the jar.

10. Shake the jar vigorously for about three minutes.

11. Stop shaking the jar and observe the contents. Record what is happening to the contents.

- Initial observations:

12. Place the jar in a spot where it will remain undisturbed for two days.

13. Observe what has happened to the contents after two days. Record the observations.

- Observations after two days:

14. Identify the layers by observation without disturbing the contents.

15. Draw a diagram below and label each layer.

16. Measure the thickness of each layer and complete the following Soil Chart.

SOIL CHART

Layer Material	Layer Thickness	% of Total Thickness

17. Dispose of the jar contents as recommended.
18. Clean and return all equipment, tools and supplies to their proper storage areas.
19. Clean up the work area.

The texture of a soil depends on how much sand, silt and clay are present. Soils can be classified as having a **coarse**, **medium** or **fine texture**.

A soil with a **coarse texture** has more than 80% sand; it is loose and won't stick together.

A soil has a **fine texture** if it has more than 40% clay in it. Clay molds well when it is wet. When dry, it forms hard lumps. Wet clay can be rolled into a long 'ribbon'.

Medium-textured soils are in between the sand and clay soils. Loam is an example of a medium-textured soil. It consists of approximately equal amounts of sand, clay and silt. Loam can be rolled into a good ribbon when it is wet. It feels gritty, but it can be moulded like dough. The medium-textured soils are the most suitable for agriculture because they possess the best combination of sand and clay.



If a soil sample contains a lot of sand, you will be able to see the particles and feel their grittiness. Also, when sand is dumped into water, the particles sink to the bottom quickly because of their large size.

Clay particles are too small to be seen by the naked eye. Wet clay is sticky rather than gritty. When clay is dumped into water, the mixture stays murky for a long time because of the small size of the particles.

The size of silt particles is in between that of sand and clay particles.

JOB SHEET 7

PERFORMING A RIBBON TEST

EQUIPMENT, TOOLS AND SUPPLIES

- Soil samples
- Water
- Paper towel

PROCEDURE

Note: If an excellent ribbon can be made, the sample belongs to the fine-textured group of soils. If a ribbon cannot be made at all, it is coarse-textured, and if the ribbon is fair or good, the sample belongs to the medium-textured group.

1. Obtain several different soil samples.
2. Place soil from one sample in the palm of your hand and add a little water.
3. Make a ribbon by rolling the soil between your fingers and the base of your thumb.

Note: The higher the clay content, the better the ribbon will be.

4. Record the results on the chart below.
5. Test the remaining samples of soil and record the results.

Sample No.	Type of Ribbon (none, fair, good, excellent)	Texture of Soil (coarse, medium, fine)

6. Dispose of the samples as directed.
7. Clean up the work area.

JOB SHEET 8

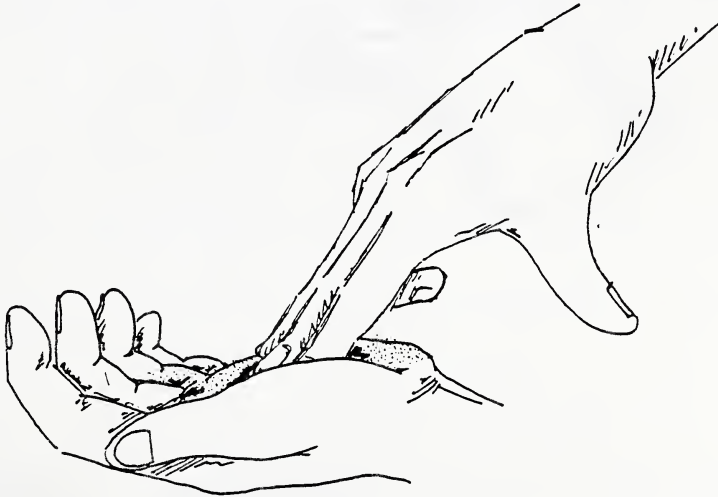
PERFORMING A SOIL-FEEL TEST

EQUIPMENT, TOOLS AND SUPPLIES

- Soil samples
- Water
- Paper towel

PROCEDURE

1. Obtain several different samples of soil.
2. Place soil from one sample in the palm of your hand and add a small amount of water.
Note: Too much water will make it difficult to get an accurate feel of the soil.
3. Rub the soil with your fingers, crushing all the lumps.
4. Use one or more of these words to describe soil-feel:
 - sticky
 - gritty
 - smooth.



Note: If the sample is:

- very sticky, it is a clay
- very gritty, it is a sand
- very sticky but also gritty, it is a sandy clay
- not sticky but very smooth, it is silt loam.

6. Record the test results on the following chart.

TEST RESULTS CHART

Sample No.	Soil-Feel	Type of Soil

7. Repeat the procedure with the remaining soil samples.
8. Dispose of the samples as directed.
9. Clean up the work area.

WATER IN THE SOIL

Different types of soil hold different amounts of water. The amount of water that can be held by a type of soil is known as that soil's POROSITY. A soil's porosity affects its ability to grow plants.

Soil can hold water because there are small spaces between the particles or little pieces of soil. These spaces, called pores, can hold air or water. Plants need both air and water to survive and grow. If all the spaces are filled with air the plants will die of DROUGHT.

If drainage is good, there is usually no problem with having too much water in the soil. The excess water will flow or sink into underground sources deep in the earth.

The type of soil determines the amount of water held. A sand grain is very smooth and does not hold water very well. Clay particles are shaped like jumbled stacks of coins. There are many places to store water. The amount of water a soil will hold depends on the amount of sand and clay present and the provisions for adequate drainage.



JOB SHEET 9

TESTING SOIL PERMEABILITY

EQUIPMENT, TOOLS AND SUPPLIES

- Plastic pipe, 15 cm diameter, 25 cm long, 3 sections
- Plastic pails, 3
- Water
- Wooden dowels 13 mm diameter, 30 cm long, 6 sections
- Watch
- Soil and sand samples
- Pencil
- Liquid measuring jug, 1 L capacity

PROCEDURE

Note: Read the whole job sheet before starting.

1. Obtain two soil samples that differ in colour or texture. Try to get sandy soil and clay or silty soil.
2. Obtain a third sample containing only sand.
Note: Dry the samples if required.
3. Break up the lumps in each sample. Remove all stones, vegetation and twigs.
4. Secure a cloth covering over one end of each pipe.
5. Fill the pipe with equal amounts of the samples.
6. Label each container with the type of material it contains.
7. Place two wooden dowels over the openings of three empty pails.
8. Support each filled pipe over a pail.
9. Measure one litre of water.

10. Add the water to the first sample.

Note 1: The rate that water is added and the time when water stops coming out of the bottom of the top container.

Note 2: This time interval is the rate that water moved through the soil. This is known as the **PERMEABILITY** or **FILTRATION RATE**.

11. Record the results of the procedure on the Test Results Chart.
12. Repeat the procedure for the remaining samples.
13. Dispose of the samples as recommended.
14. Clean and return all equipment, tools and supplies to their proper storage areas.
15. Clean up the work area.
16. Complete the following Test Results Chart for each sample.

TEST RESULTS CHART

	Sample 1	Sample 2	Sand
How long did it take for the water to start coming through the soil?			
How long did it take for water to stop coming through the soil?			
Which soil retains water for the longest time? Rate the samples with the sample with the longest time and the sample that drained fastest.			

17. Answer the following questions.

- What changes a soil's ability to hold water?

- How does the type of soil affect water run-off after a rainstorm?

- How does soil type affect water retention?

JOB SHEET 10

DEMONSTRATING SOIL WATER MOVEMENT

EQUIPMENT, TOOLS AND SUPPLIES

- Can opener
- Pan, 20 cm x 30 cm x 10 cm
- Tin cans, 3
- Nail, 8 cm long
- Claw hammer
- Watch
- Water
- Newspaper
- Paper towel

PROCEDURE

1. Select two or more soils that differ in texture or colour. Try to get a sandy soil and a clay or silty soil.
2. Break up the lumps in each sample.
3. Remove all stones, vegetation and twigs.
4. Spread each soil sample on a separate piece of newspaper and allow it to dry for at least two days.
5. Break up any remaining lumps.
6. Prepare the cans by removing one end.
7. Use the hammer and nail to punch drainage holes in the other end.
8. Place a small piece of paper towel inside the can over the holes so that the soil will not plug them.
9. Fill each can with a different sample of soil and tamp the soil surface lightly.

10. Label each can with the type of soil it contains.

11. Fill the pan with water to a depth of 5 cm.

12. Set the soil-filled cans in the pan.

13. Record the time.

Note: This is the starting time of the experiment.

14. Check the soil every 30 minutes for surface wetness by gently touching the top surface of the soil to see if it feels wet. Keep a record of the time it takes for the top surface of each soil sample to become wet.

Soil Sample	Starting Time	Time Soil Surface Became Wet	Elapsed Time

15. Dispose of the samples as recommended.

16. Clean and return all equipment, tools and supplies to their proper storage areas.

17. Clean up the work area.

18. Answer the following questions.

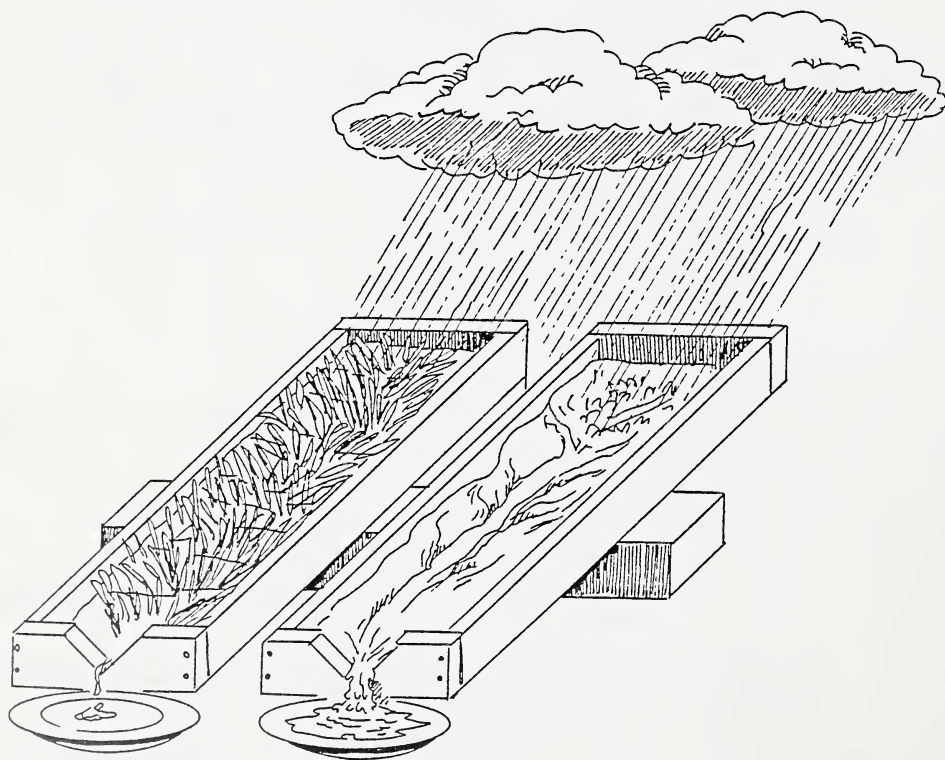
- Which soil sample became wet first? _____
- Which soil sample became wet last? _____
- Explain how water movement is affected by the type of soils.

EROSION

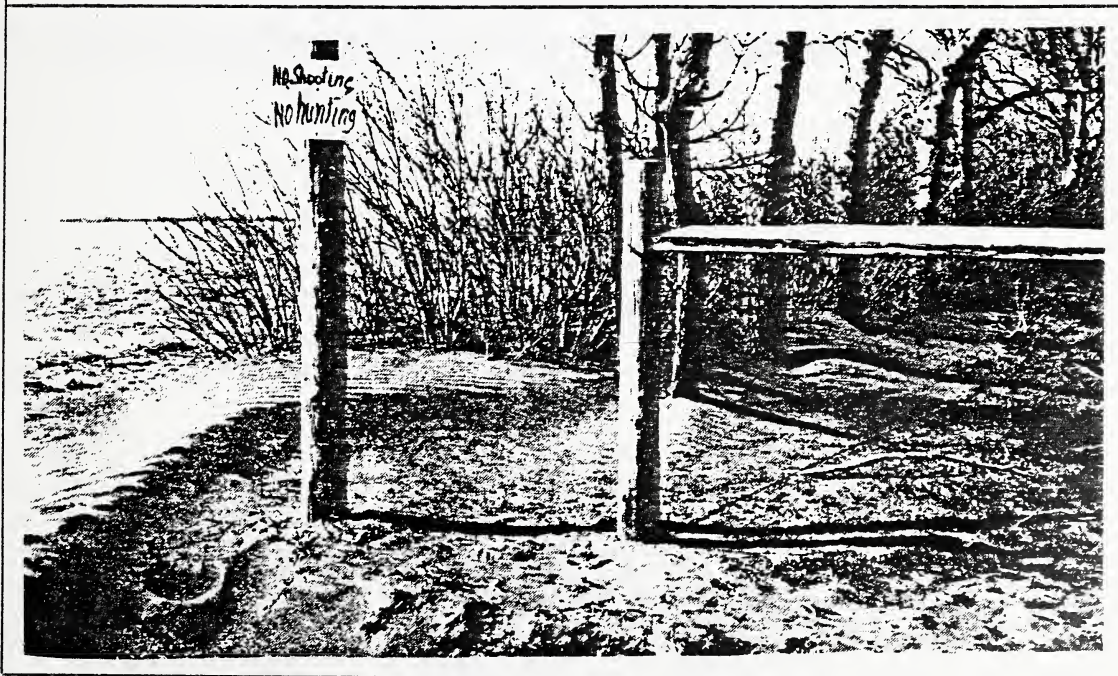
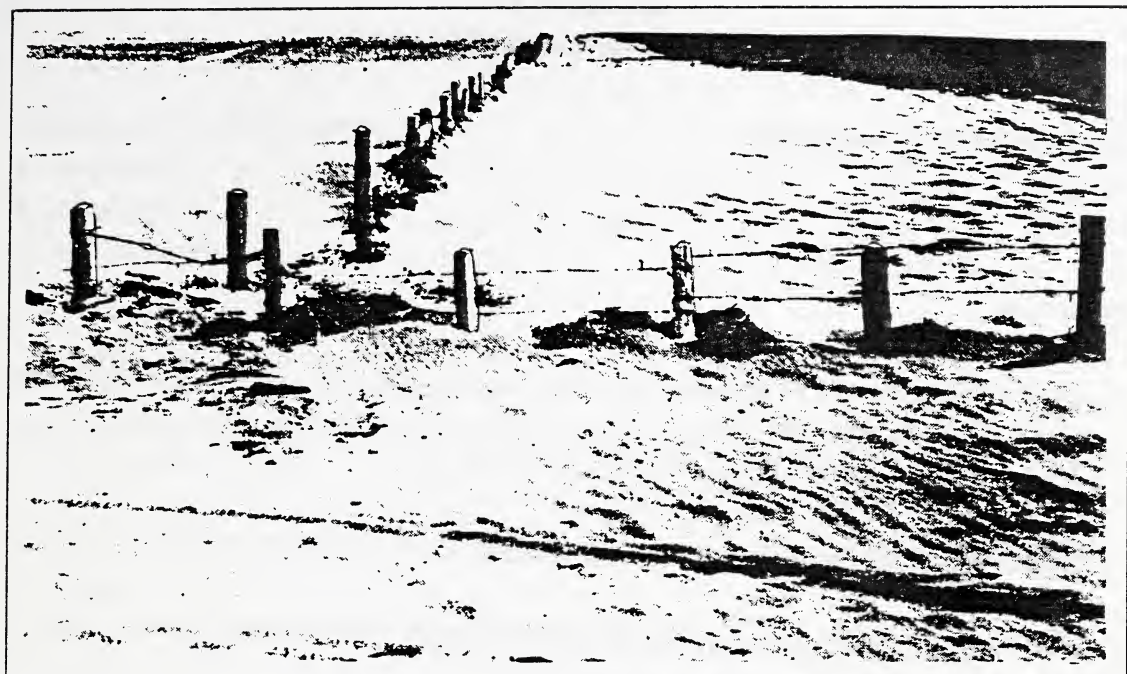
Erosion occurs in nature when soil particles are moved from one place to another. Usually, the soil is moved by wind or some form of water such as rain or ice.

On cultivated farm land, erosion may cause problems. Usually, the most fertile part of the soil, the topsoil, is removed. If soil erosion is allowed, the land can lose its ability to grow crops.

When it rains hard, or snow melts quickly, the soil cannot absorb all of the water. Puddles after a heavy rain are an example of water which is not absorbed by the earth. As the water runs away, it carries topsoil with it. This is called water erosion. Plant coverings may be used to reduce the effect of water erosion on slopes.



On a very windy day you have to close your eyes against the dust. You may have seen a whirlwind carrying dust. The wind is moving topsoil from one place to another. This is called wind erosion. Dry soil that has no plants growing in it blows away very easily because it is light and there is nothing to hold it down.



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JOB SHEET 11

DRAWING EROSION FEATURES

EQUIPMENT, TOOLS AND SUPPLIES

- Pencil
- Paper

PROCEDURE

1. Locate one example of wind erosion and one area of water erosion in your community.

Note: The erosion example does not have to exhibit massive damage. Any example that demonstrates the features will be sufficient for this task.

2. Draw a simple illustration to show each type of erosion.
3. Label each illustration as either wind erosion or water erosion.
4. Attach the drawings to this page.

JOB SHEET 12

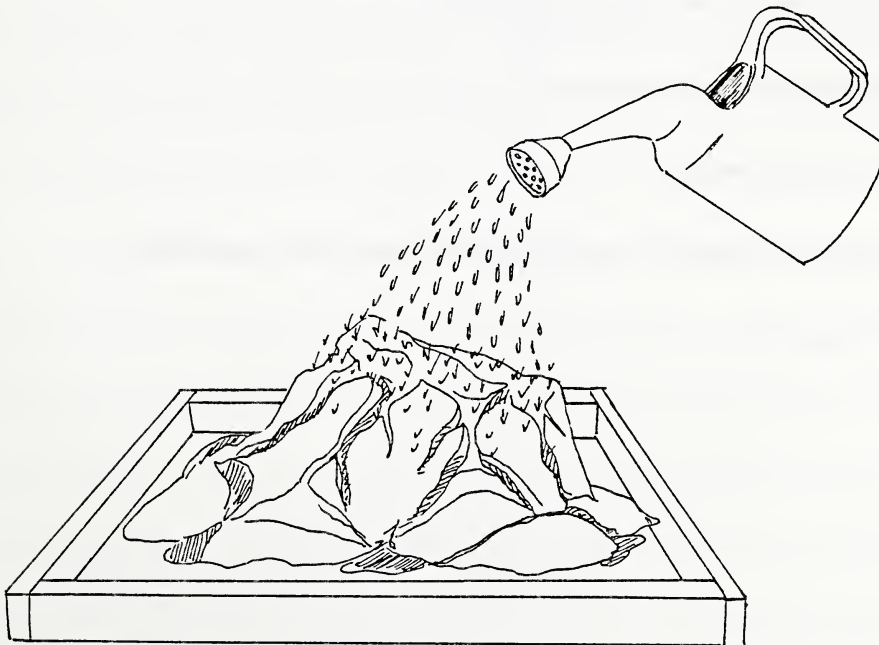
DEMONSTRATING WATER EROSION

EQUIPMENT, TOOLS AND SUPPLIES

- Shallow pan
- Watering can
- Fine soil sample
- Water

PROCEDURE

1. Place the soil in the pan.
2. Use your hands to mound the soil surface so it slopes away from the centre of the pan to the edges.
Note: There should be a small hill in the centre of the pan.
3. Gently and slowly spray water on the top of the mound until the soil is completely wet.



4. Record the results of the first wetting on the following chart.

TEST RESULTS CHART

First Wetting
Second Wetting

5. Continue to spray water slowly onto the wet mound.
6. Record the results of the second wetting.
7. Dispose of the soil as directed.
8. Clean and return all equipment, tools and supplies to their proper storage areas.
9. Clean up the work area.

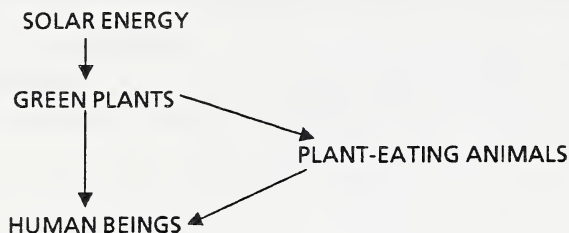
STUDENT ACTIVITIES

1. a. Brainstorm: What practices will reduce the effects of water and wind erosion?
- b. Using the information learned from the brainstorming activity, complete the following chart.

Practices Used to Reduce Erosion	Why Does It Work?

PLANT PRODUCTION

Plants are an important part of the food chain. They provide food and fibre to animals and human beings. Only plants can transfer solar energy into a form of energy that humans and animals can use.



STUDENT ACTIVITIES

1. List examples of:

- plants that provide food for animals

- plants that provide food for humans

- animals that provide food for humans

2. Honey is a source of energy for human beings.

- a. What animal is involved in the making of honey? _____
- b. How are plants involved in honey-making? _____

PLANT PARTS

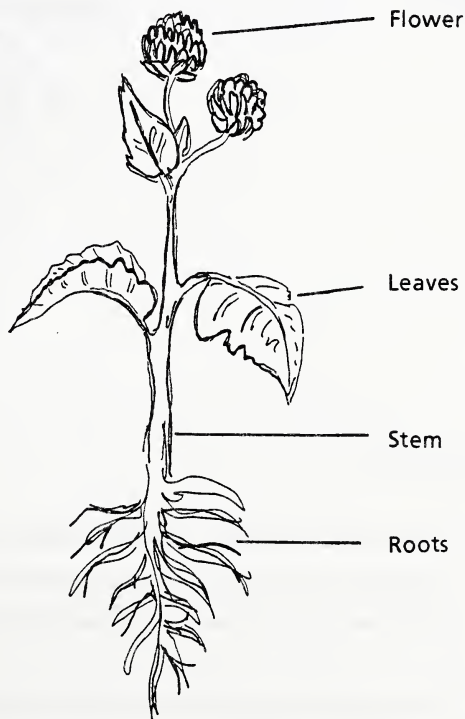
Plants are living things, so they need sources of energy to help them grow and stay healthy.

Plants need:

- light from the sun (or special artificial light)
- carbon dioxide from the air
- nutrients (food) and water from the soil.

Plants use their different parts to take in and use light, carbon dioxide, nutrients and water.

Plant parts include roots, stems, leaves and flowers.

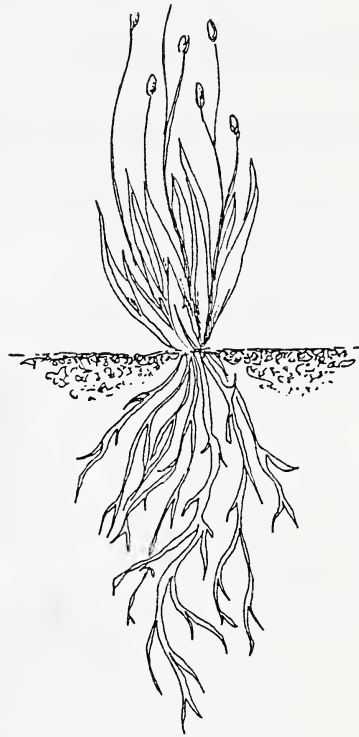


ROOTS

Roots will:

- hold the plant upright
- anchor the plant to the soil
- absorb water and nutrients from the soil
- store food for the plant.

Some plants produce kilometres of roots.



There are two types of root systems:

- **TAPROOT**
 - A taproot has one fleshy root and a few root hairs.
 - Examples of taproots are carrots, sugar beets and sweet clover.
 - Often the taproot is the part of the plant that is used by the farmer.
- **FIBROUS ROOTS**
 - A fibrous root system has many similar slender roots.
 - Examples of fibrous root systems are grains and corn.

STUDENT ACTIVITIES

1. Define the term 'nutrition'.

2. Which agricultural plants have the following type of roots? Give three examples of each.

● Taproot: _____

● Fibrous root: _____

STEMS

The stem of a plant has many purposes. The stem of a plant:

- holds the leaves upward to catch the sunlight
- supports the plant above the ground
- transports water and food between the leaves and the roots
- stores food for the plant.

Some plants have a stem that is very short and hard to see. Other plants have a long stem which may stand up or lie on the ground. Most plants have some type of stem.



JOB SHEET 13

DEMONSTRATING WATER MOVEMENT

EQUIPMENT, TOOLS AND SUPPLIES

- Celery
- Food dye
- Sink
- Knife
- Water glass

PROCEDURE

Note: The stem's job of carrying water and nutrients can be demonstrated with the use of a celery stalk. A celery stalk is not actually a stem. However, water travels the same way in both the celery stalk and a plant stem.

1. Fill the glass with water and colour the water with food dye.
 2. Cut about 1 cm off the bottom of some celery stalks while holding them under the water.
 3. Place the stalks in the glass of coloured water.
 4. Set the stalks in sunlight.
 5. After a short time, examine the celery. Record the results.
-

6. With the sharp knife, cut across the stalk and examine the cut end.

Note: Did the colour travel in any particular part of the stem, or did it soak through the entire stalk?

Record the results.

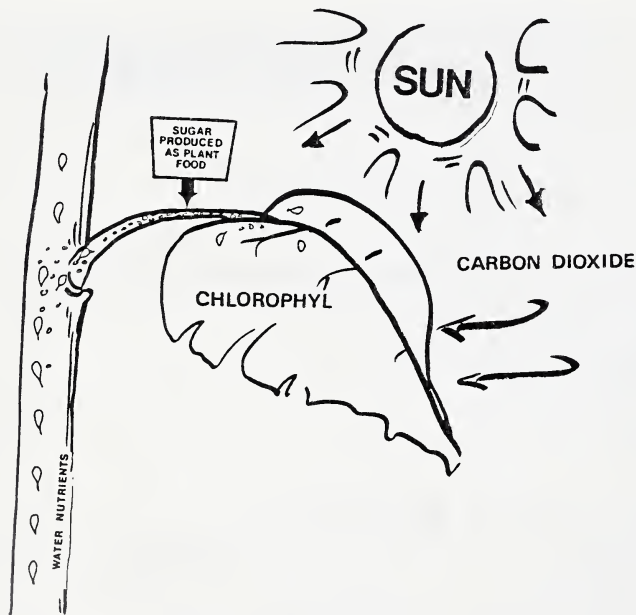
7. Dispose of the celery stalks.
8. Clean and return all equipment, tools and supplies to their proper storage areas.
9. Clean up the work area.

LEAVES

Leaves grow in many different shapes and sizes. They all, however, have the same purpose. The leaf is the plant's factory. The food for the plant is produced in the leaves.

Chlorophyll in the leaf makes it possible for the leaf to produce food. To make food, the chlorophyll must have three things:

- carbon dioxide from the air
- energy from the sun
- water and nutrients from the soil travel to the leaves through the plant's roots and stems.



Chlorophyll is green and gives the plant its green colour. If there is a lack of chlorophyll, the leaves of the plant will lose their green colour. The plant cannot produce food for itself because its factory, chlorophyll, does not exist. Chlorophyll may be lacking because:

- the plant is not getting enough sunlight and cannot keep growing
- the plant is not getting enough water or nutrients
- it is too cold for the plant to grow
- the plant has finished growing. This is what happens to grain plants. The yellow colour is a sign to farmers that it is time to harvest the grain and collect the seeds.

JOB SHEET 14

DEMONSTRATING THE IMPORTANCE OF CHLOROPHYLL

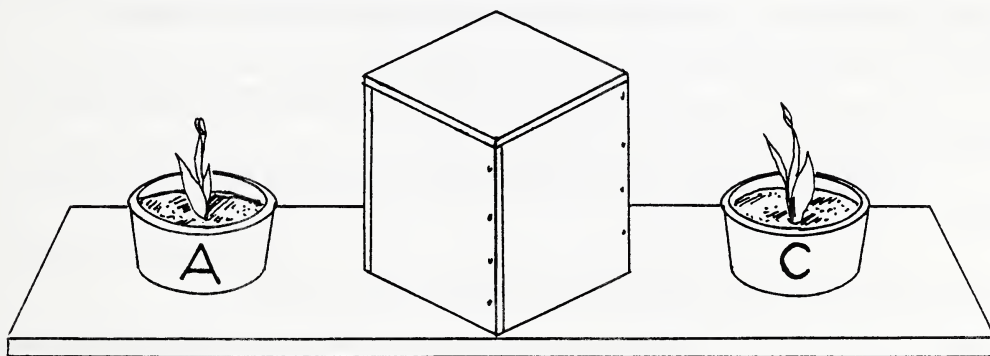
EQUIPMENT, TOOLS AND SUPPLIES

- Potted plants, 3 in very similar condition
- Cardboard box to fit over plant, 1
- Watering can
- Storage area, with sufficient sunlight

PROCEDURE

Note: This task may be done as a class project.

1. Place the plants in an area where diffused sunlight is available. Do not use direct sunlight or the plants may overheat.
2. Label the plant pots A, B and C.
3. Place the cardboard box over plant B to eliminate the sunlight.



4. Water plants A and B as required.

Note: Do not water plant C.

5. Check the plants regularly and, once each week, record what you see happening to each plant on the following chart (p. 100).

Time	Observations		
	A	B	C
Week 1			
Week 2			
Week 3			
Week 4			

6. Dispose of or store the plants as directed.
7. Clean and return all equipment, tools and supplies to their proper storage areas.
8. Clean up the work area.
9. Answer the following questions.
 - Explain what happened to each of the plants during the month of the observations.

Plant A _____

Plant B _____

Plant C _____

 - How would this information relate to what happens to crops in a field?

 - What could a farmer do to prevent his fields or crops suffering from a lack of moisture?

JOB SHEET 15

EXAMINING PLANT LEAVES

EQUIPMENT, TOOLS AND SUPPLIES

- Magnifying glass (or low power microscope)
- Plant leaves
- Pencil
- Paper

PROCEDURE

1. Select several leaves. Each leaf should be of a different type; e.g., cereal crop, grass, fleshy plant, tree.
2. Choose one leaf and draw an enlarged view of both sides on a single sheet of paper.
Note: The drawing should indicate the proper leaf shape.
3. Label each diagram; i.e., type of leaf, top of leaf, underside of leaf.
4. Use the magnifying glass or microscope to examine the leaf.
5. Draw what you see on both sides of the leaf.
6. Clean and return all equipment, tools and supplies to their proper storage areas.
7. Clean up the work area.
8. Answer the following questions.

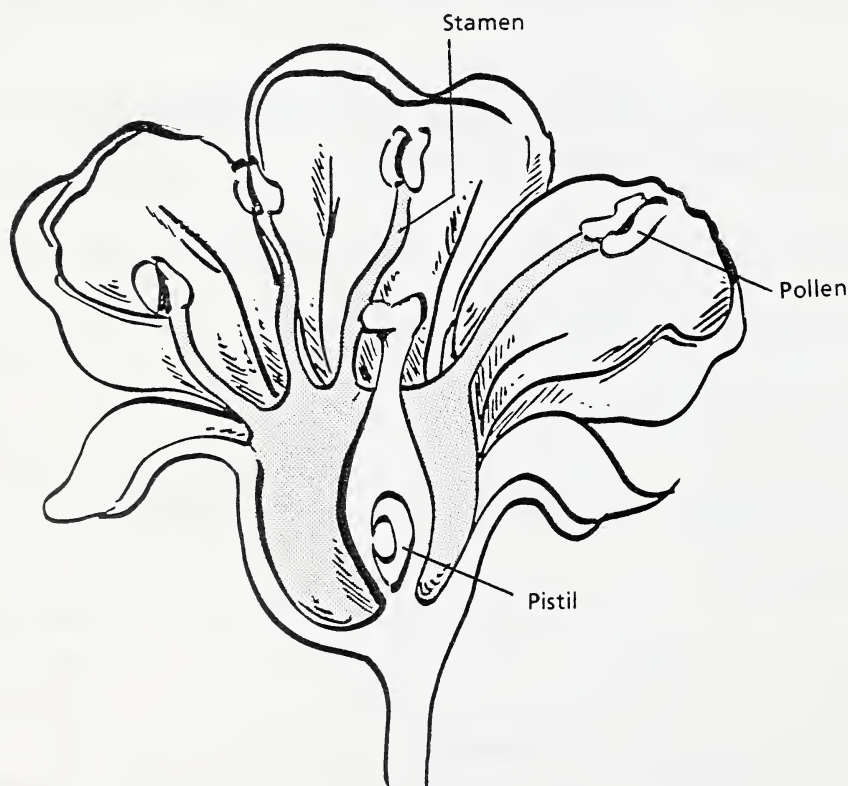
- How would you describe the structure of a leaf?

- Does the structure of a leaf remind you of a similar set of structures in the human body? Which?

FLOWERS

The flowers of a plant produce seed. Seeds allow a species of plant to continue to exist because new plants will grow from the seeds.

Seeds are produced when the plant has been pollinated. The process of POLLINATION occurs when POLLEN from the STAMEN of a flower is moved to the PISTIL of a flower.



In some plants, the seeds are protected and held by fruit which grows around them. Tomatoes, squash and cucumbers are examples of plants that hold seeds inside a fruit. Other plants, such as grain crops, have exposed seeds that have only a thin covering for protection.

Cross-Pollination

Some plants require CROSS-POLLINATION. This means that the pollen from the stamen of one plant must reach the pistil of another plant before seeds can be produced.

Pollen can be moved from one plant to another by wind or insects. Corn is planted in multiple rows to assist wind pollination.

Insects, such as bees, pick up pollen when they touch the flower of one plant. When the insect touches another flower, the pistil of that flower picks up the pollen from the insect's body. Usually, the pistil of the flower is sticky and pollen will easily cling to it.

To attract insects, flowers use colours or scents. **Flax, canola and mustard** are examples of plants with colourful flowers. A canola crop in bloom has a strong scent.



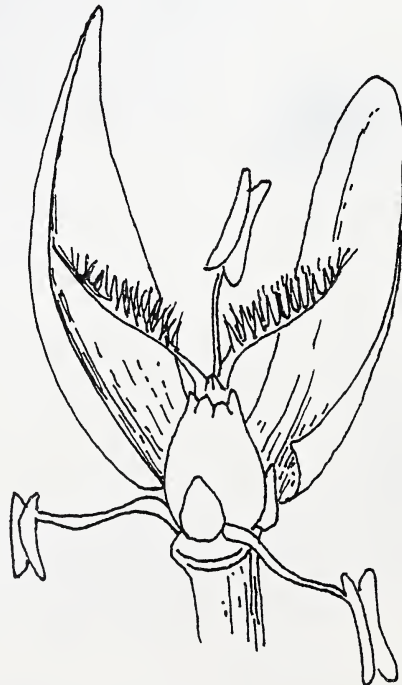
Self-Pollination

Some plants are SELF-POLLINATED. This means that seeds are produced when the pollen from the stamen of one plant reaches the pistil of the same plant. Usually this happens before the flower opens.

Wheat, barley and oats are self-pollinating plants.



A group of grain flowers is called an inflorescence.



A single grain flower is called a floret.

SEEDS

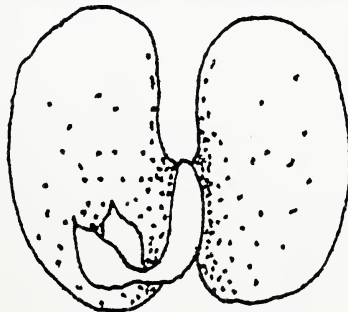
After the plant has been pollinated, the flower produces seeds. These seeds are used to reproduce the plant. Each seed contains a tiny new plant and food for the beginning growth of that plant.

There are two types of seeds:

- MONOCOTYLEDON (monocots)**
- have one tiny leaf in the embryo and one food storage area
 - corn, barley and rye are monocots.



- DICOTYLEDON (dicots)**
- have two tiny leaves in the embryo and two food storage areas
 - peas, beans, canola and sunflowers are dicots.



STUDENT ACTIVITIES

1. Review the previous section on plant growth and complete the following sentences.

- A plant grows to produce _____ so that another plant can be started.
- The plant is held in the soil by its _____.
- Some plants have one large fleshy root called a _____.
- Thin plant roots are called _____.
- The roots absorb _____ and _____ from the soil.
- Water is transported up the root and through the _____ to the leaves of the plant.
- Leaves collect _____ from the sun and _____ from the air.
- The plant is green because it contains _____; without this, leaves turn a _____ colour.
- Some plants cover the seeds with a thick pulp or flesh called a _____.
- When pollen from one plant must reach the pistil of another plant before seeds can be produced, it is said that these plants must be _____ - pollinated.
- Plants which use their own pollen are _____ - pollinated.
- If the seed has two tiny leaves and two food storage areas, then it is a _____.
- If the seed has one leaf and one food storage area, then it is a _____.

2. List the purposes of each of the following parts of the plant.

PLANT PART

PURPOSE

ROOTS

STEMS

LEAVES

FLOWERS

FRUIT

EATING PLANT PARTS

Plants are part of the food chain. Humans and animals eat plants.

The root, stem, leaf, flower, fruit and seed of different plants are eaten.

STUDENT ACTIVITIES

1. For each plant listed below, research and record which plant part is eaten.

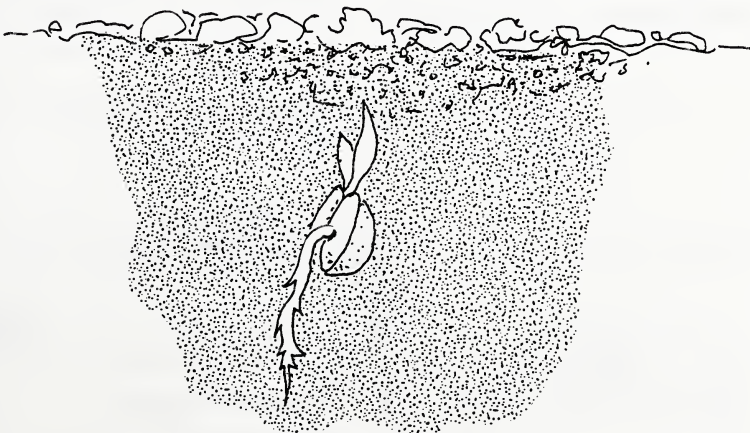
Plant	Plant Part Eaten
sugar beet	
wheat	
cauliflower	
apple	
lettuce	
peas	
radish	
alfalfa	
barley	
carrot	
broccoli	
canola	
corn	
clover	
spinach	

GERMINATION

A seed does not grow by itself. The seeds found in a package or in a granary are not growing. They are dormant. That is, the seed is waiting for the proper conditions for germination. Seeds require warmth and moisture to germinate. Without these conditions, a seed will not grow. Germination starts the seed's growth into a plant.

Other factors that affect the germination of a seed include:

- Older seeds do not germinate as well as new seeds.
- Diseased seeds may not germinate or they may start their growth and then fail.
- The size of the seed can affect its growth. A large seed contains more food for storage for the embryo than does a smaller seed. Thus, a large seed may have a better chance of surviving germination and beginning growth stages.
- The way the seed is covered, or the soil, affect plant survival. The soil must have sufficient moisture and drainage. Insufficient soil cover may cause the seed to dry out. A seed that is planted too deep may not be able to send its sprout to the surface.



JOB SHEET 16

DEMONSTRATING THE EFFECT OF TEMPERATURE ON GERMINATION

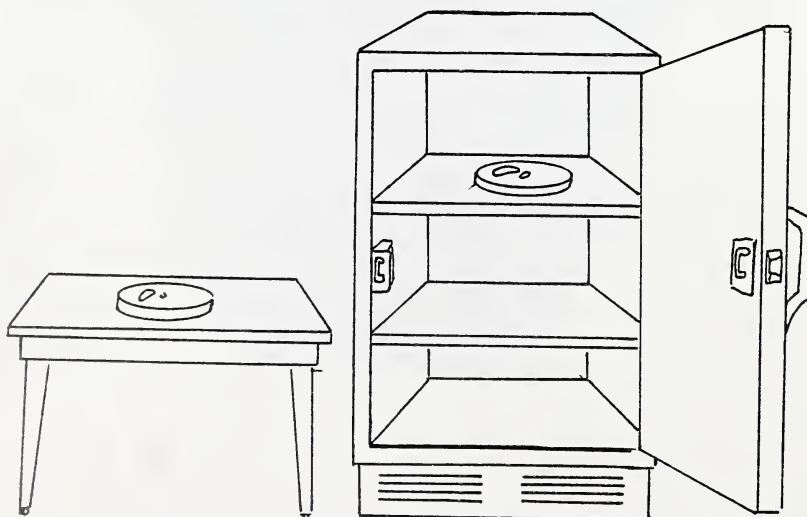
EQUIPMENT, TOOLS AND SUPPLIES

- Refrigerator
- Seeds, 10
- Petrie dishes, covered, 2
- Paper towels
- Water

PROCEDURE

Note: Any rapidly germinating seeds, such as radishes, peas, beans or wheat of one variety may be used.

1. Select ten seeds of similar size, shape and condition.
2. Place two layers of moist paper towels in the bottom of each container.
3. Place five seeds in each container.
4. Cover the seeds with two layers of moist paper towels.
5. Place one container in a refrigerator. Leave the other container at room temperature.



6. Check the seeds each day. If necessary, add enough water to moisten the paper towel.

Note: The seed beds must not dry out.

7. Each day, count the number of seeds that have germinated (have grown sprouts). Record the results on the following chart.

Day	1	2	3	4	5	6	7	8	9	10
Number of seeds germinated at room temperature										
Number of seeds germinated in refrigerator										

8. Dispose of the seeds as directed.
9. Clean and return all equipment, tools and supplies to their proper storage areas.
10. Clean up the work area.
11. Answer the following questions.
- In which situation (room temperature or refrigerator) were more seeds germinated?

 - In which situation (room temperature or refrigerator) did seeds germinate more quickly?
Explain your results.

 - If a farmer plants seeds when the soil is very cold, what will or will not happen?

JOB SHEET 17

DEMONSTRATING THE EFFECT OF MOISTURE ON GERMINATION

EQUIPMENT, TOOLS AND SUPPLIES

- Seeds, 15
- Petrie dishes, covered, 3
- Paper towels
- Water

PROCEDURE

Note: Any rapidly germinating seeds, such as radishes, peas, beans or wheat of one variety may be used.

1. Select fifteen seeds of similar size, shape and condition.
2. Place two layers of moist paper towels in the bottom of each dish.
3. Place five seeds in each dish.
4. Label the dishes.



5. Cover the seeds in each dish with two layers of moist paper towels.
6. Store the dishes at room temperature out of direct sunlight.
7. Prepare each dish in the following way:
 - No. 1 – do not add more water
 - No. 2 – fill the dish with water
 - No. 3 – add just enough water to keep the paper towel moist.
8. Check the dishes each day. Maintain the dishes according to the label instructions.
9. Each day, count the number of seeds that have germinated in each dish. Record the results on the following chart.

Sample	Day									
	1	2	3	4	5	6	7	8	9	10
1 – No water added										
2 – Filled with water										
3 – Enough water to keep towel moist										

10. At the end of the test dispose of the seeds as directed.
11. Clean and return all equipment, tools and supplies to their proper storage areas.
12. Clean up the work area.
13. Answer the following questions.

- In which glass did the most seeds germinate?

- Why did more seeds germinate in this glass than in the other glasses?

- What could happen if a farmer planted seeds in moist ground but there was no rain or other moisture for a month?

- What could happen to the seeds if a farmer planted them in moist ground and it rained steadily for a month?

JOB SHEET 18

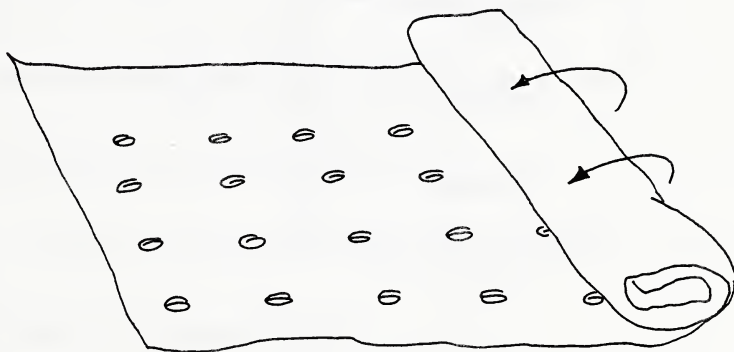
TESTING GERMINATION RATES

EQUIPMENT, TOOLS AND SUPPLIES

- Towels, paper or cloth
- Pail
- Grain seeds, 100
- Watering can
- Water
- Pencil
- String

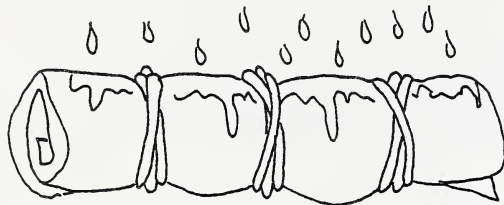
PROCEDURE

1. Lay a length of towel on a suitable, flat surface.
2. Space the seeds in four rows on the towel.

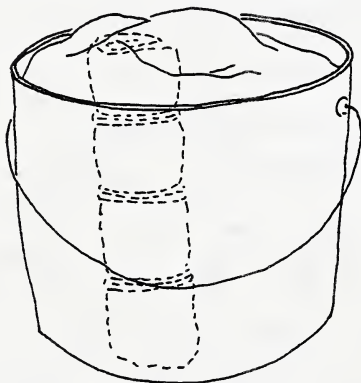


3. Cover the seeds with another towel.
4. Fill the watering can with water and carefully dampen the towels with the watering can.
5. Roll the towels loosely leaving space for sprouts to develop.

6. Hold the roll together using string wraps spaced every 5 cm to 7 cm.



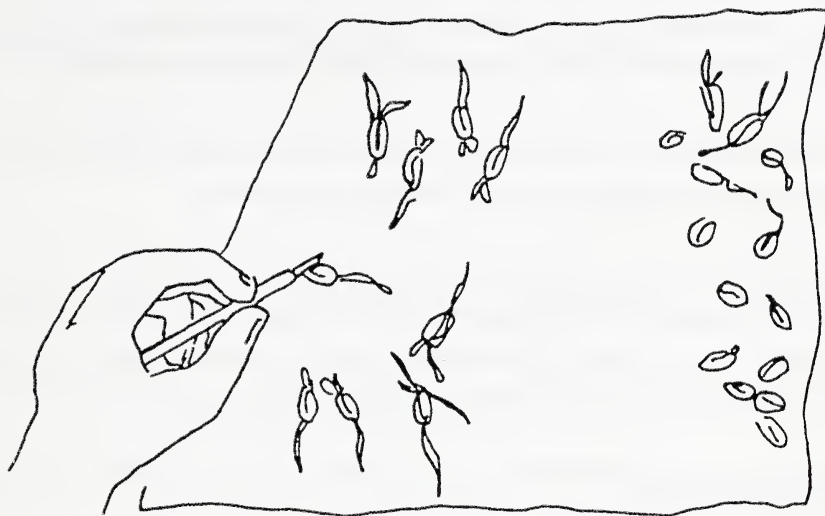
7. Stand one end of the roll in the pail and cover the remainder of the roll with moist toweling.



Note: If several tests are to be done, the rolls can be placed together in the pail.

8. Place the pail in a storage area with sufficient light and a temperature of 20°C.
9. Check the pail daily and water the roll as required to keep the surface moist.

10. After seven days, unroll the towel.
11. Count the sprouted seeds having both a root and a shoot.



Note: If more than one test was done, the results can be averaged.

12. Calculate and record the germination rate.

Number of sprouted seeds = GERMINATION RATE = _____ %

13. Dispose of the towel and seeds as directed.
14. Clean and return all equipment, tools and supplies to their proper storage areas.
15. Clean up the work area.

FERTILIZER

Plants need food in order to grow. The soil provides much of this food, or nutrients, to the plants. The most important soil nutrients are:

- nitrogen (N) – promotes lush growth and dark green colour
- phosphorus (P) – promotes root growth, flower and seed development and early maturity
- potassium (K) – promotes strong stems, good root systems and resistance to disease.

As a plant grows, it uses up some of the nutrients from the soil. Fertilizer contains these nutrients and farmers add fertilizer to the soil to prepare the soil for healthier plant growth.

Fertilizers are named according to the amount of nitrogen, phosphorus and potassium they contain. Phosphorous is found in phosphate and potassium is found in potash. The first number is the percentage of the mixture that is nitrogen (N). The second number is the percentage of the mixture that is phosphorus (P), and the third number is the percentage of potassium (K).

Therefore, if a fertilizer has this label:



- it contains
- 18% nitrogen
 - 46% phosphorus
 - and no potassium.

STUDENT ACTIVITIES

1. For each of the following fertilizers, identify the content of nitrogen, phosphorus and potassium.

- 34 – 0 – 0 has _____ % nitrogen; _____ % phosphorus; _____ % potassium
- 21 – 0 – 0 has _____ % nitrogen; _____ % phosphorus; _____ % potassium
- 18 – 46 – 0 has _____ % nitrogen; _____ % phosphorus; _____ % potassium
- 0 – 0 – 60 has _____ % nitrogen; _____ % phosphorus; _____ % potassium
- 82 – 0 – 0 has _____ % nitrogen; _____ % phosphorus; _____ % potassium
- 20 – 30 – 20 has _____ % nitrogen; _____ % phosphorus; _____ % potassium
- 20 – 20 – 20 has _____ % nitrogen; _____ % phosphorus; _____ % potassium

2. Name the nutrient described in each of the following sentences.

- This nutrient helps the plant's leaves grow a dark green colour. It is the first number in a fertilizer's name.

- The purpose of this nutrient is to help the root grow strong and help the flower and seeds to develop. In 18 – 40 – 0 fertilizer, it is the 40.

- This nutrient is important for the balanced growth of the plant. It also helps the plant avoid diseases. Fertilizer called 0 – 0 – 60 contains only this nutrient.

3. Visit and interview a local supplier of fertilizer. Complete the following information sheet during or after your visit.

- What types of fertilizer are sold in this store?

- What are the most common types of fertilizer used by the farmers in your community?

- Why do the farmers use these types of fertilizer?

- How do the farmers decide which fertilizer to use?

- What methods can be used to apply fertilizer?

- How is fertilizer stored?

- What happens if fertilizer gets wet?

- Are there any special safety precautions when handling fertilizer?

FACTORS OF PRODUCTION

There are many things that affect farm production. These are called **FACTORS OF PRODUCTION**.

Farmers use factors of production to make decisions about what to grow. Some factors will affect the other industries in agriculture.

The factors of production are:

- climate
- soil
- economics
- market
- labour
- transportation.

CLIMATE

This includes conditions such as rain, sun, snow, temperature and wind. The weather has a great influence on production.

SOIL

In agriculture, soil refers to the top layer of the earth, which can support the growth of plants.

ECONOMICS

This is the money necessary for the production and sale of farm products. For the farmer, economics includes income and expenses. The economic situation of the rest of the world affects agricultural production as well.

MARKET

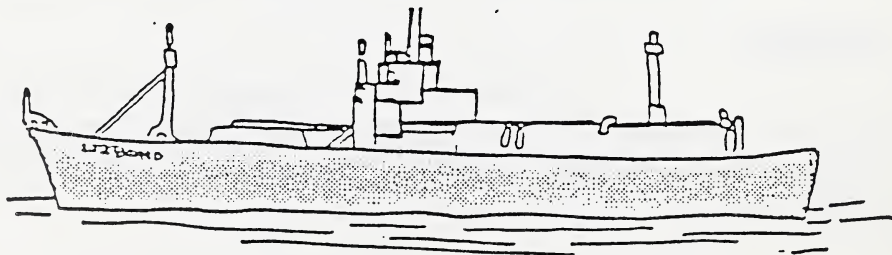
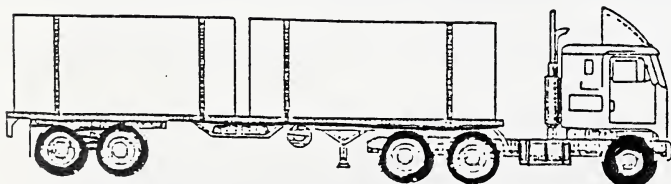
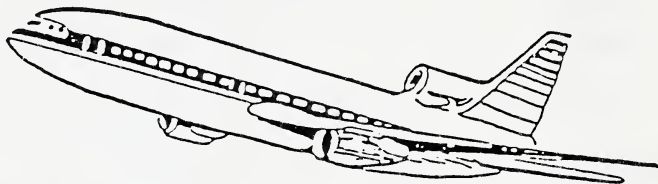
The market is the meeting place of the buyer and the seller. Marketing includes the buying and selling of a product.

LABOUR

The labour force consists of the people who work in agricultural production and agricultural industries.

TRANSPORTATION

Various modes of transportation get supplies to the farmer and the farmer's products to the consumer.



These factors of production can affect:

- whether the farmer raises field crops or livestock
- whether the farmer grows canola, wheat, barley, oats, hogs, cattle or poultry
- whether the farmer specializes in one product or raises several products at the same time
- the income the farmer receives for the product
- the cost incurred to develop a crop
- the way a product gets to the consumer
- the jobs available in agricultural industries
- the types of food available to consumers.

STUDENT ACTIVITIES

1. Each of the following statements is an example of a factor of production. Under each statement name the factor being described.

Note: The factors are: climate, soil, economics, market, labour and transportation.

- The number of days without frost helps the farmer decide what kind of crop can be grown.

- In Alberta, the soil where you live may be different from the soil 300 kilometres away.

- During harvest, a farmer may hire people to help do the work on the farm.

- The cost of seed, fertilizer and farm equipment is paid for by the farmer.

- Prince Rupert is one of the places to which trains take Alberta's grain.

- A grocery store sells many different products.

- Hail storms can damage a wheat crop.

- Specially equipped airplanes take Alberta cattle to other countries around the world.

- The farmers' market is open on Saturdays.

- Tractors are purchased with payments made over a period of time.

2. Which factors of production do you believe have the most effect on local farms? Why?

ALBERTA AGRICULTURAL PLANTS

Farmers in Alberta grow several types of plants. Some of these are eaten directly as food by people. Other plants are used for animal feed, and later the animals are slaughtered for human consumption.

Grain plants are a very common crop in Alberta.



Canola



Oats



Wheat



Barley



Corn



Rye

CEREAL CROPS

One of Alberta's most important plant crops are cereals. Some characteristics of important cereal crops are listed below.

WHEAT

- occupies about 20% of Alberta farmland
- produces 25% of total crop income
- several classes of wheat are grown for differing purposes across the province
- sales controlled by the Canada Wheat Board.

BARLEY

- occupies second largest area of Alberta farmland
- accounts for about 15% of total crop income (second highest)
- 50% of the crop is used as livestock feed
- processors of malt are the second highest consumers
- used as a soup cereal and for flour.

OATS

- minor income rating but an important crop
- used as feed for livestock
- used in processed foods, e.g., oatmeal.

RYE

- source of flour for bread making
- used for producing alcohol
- used in some cereals
- used mainly for animal feed.

OILSEED CROPS

CANOLA

- third highest crop income; about 10% of total
- valued for its edible oil (accounts for much of the edible oil used in vegetable oil, margarine and shortening)
- a high-protein meal for animals.

FLAX

- uses small proportion of Alberta farmland
- mainly oilseed flax grown in Alberta, for linseed oil
- linseed meal, a by-product of oil extraction, is a popular livestock feed.

VEGETABLES AND SPECIAL CROPS

POTATOES

- largest vegetable crop in Alberta
- 50% used for processed food products:
 - French fries
 - dehydrated granules
 - potato chips
 - canned potatoes.

CARROTS

- second to potatoes in importance as a commercial vegetable
- used in fresh and processed forms.

PEAS

- Alberta is a major exporter of processed peas
- may be used as animal or human food.

SMALL FRUITS

a relatively new Alberta industry producing fresh and processed fruits including strawberries, raspberries and Saskatoons.

OTHER VEGETABLES

Other vegetables grown in Alberta include:

- | | |
|------------|--------------|
| ● cabbage | ● rutabaga |
| ● onions | ● mushrooms |
| ● lettuce | ● tomatoes |
| ● parsnips | ● cucumbers. |
| ● beets | |

SPECIAL CROPS

- corn
- beans
- mustard
- lentils.

Notes

- A variety of vegetables are grown commercially by market gardeners and greenhouse operators.
- Some crops are produced under contracts between growers and processors.
- Major potential is in increased demand for fresh vegetables. Many are sold at farmers' markets or at farm gates. Many are sold to retailers and wholesalers and to processors.

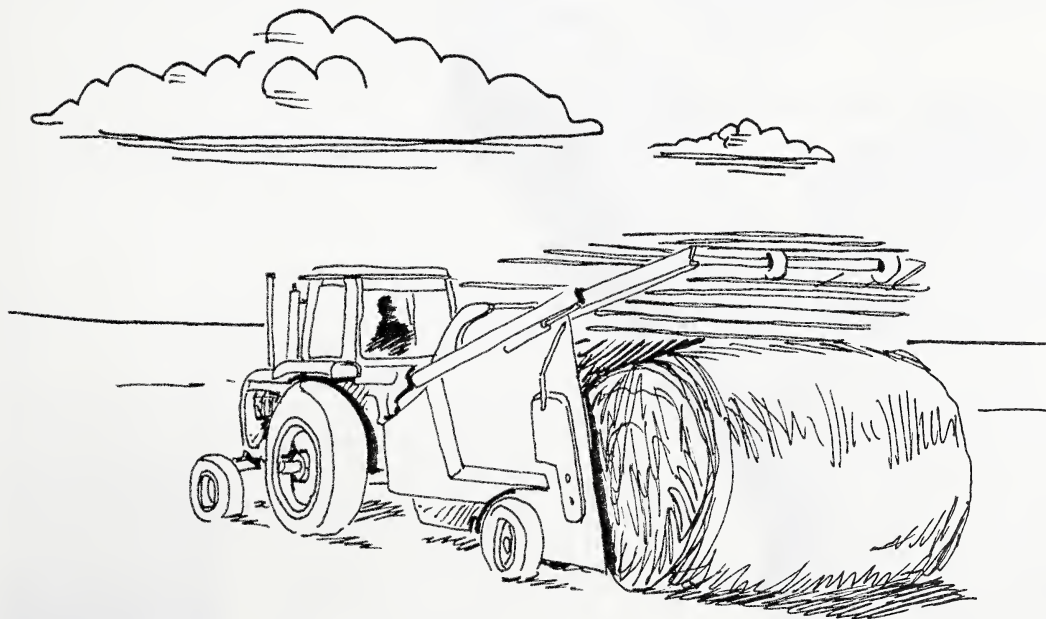
FORAGE CROPS

Although bales of hay are a common sight in many parts of Alberta, large amounts of forage crop seeds are produced in the northern areas of the province, especially in the hilly areas of the Rockies. Forage crops include:

- ALFALFA
- BROME
- FESCUE

Forage crops are used primarily for animal feed and for pasturage after the seed is harvested. They make up 70 - 80% of food rations for ruminant livestock.

Forage crops also naturally restore nutrients to the soil and thus help farmers maintain the productivity of their soil.



STUDENT ACTIVITIES

Based on your research and knowledge of local farming:

1. Which major crops are grown in your area?

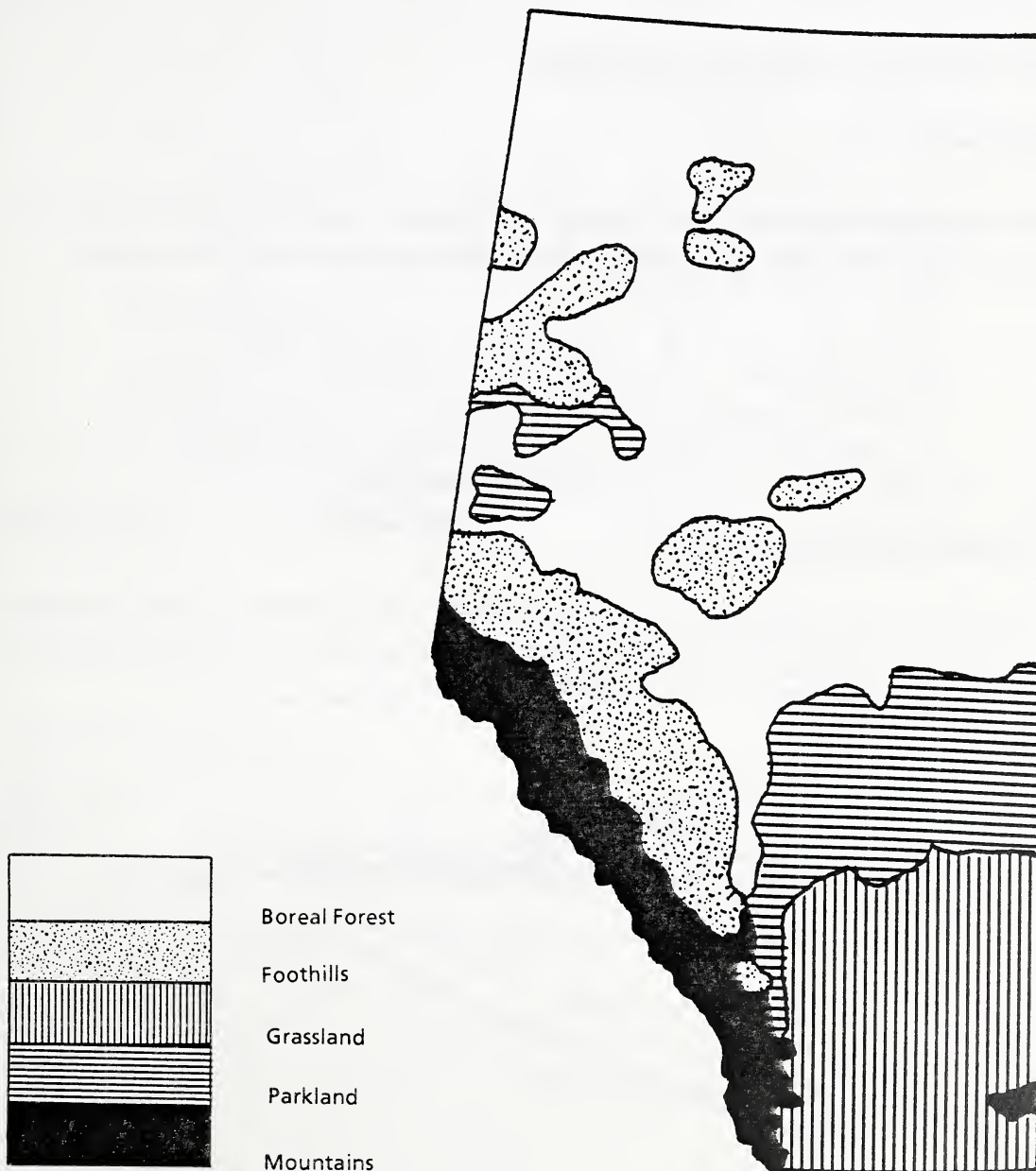
2. Which crops need to be processed into one or more other products before they can be consumed by people?

3. Which crops do not need processing before being consumed by humans?

4. Which crops are used to feed animals?

ECOREGIONS OF ALBERTA

Ecoregions are large areas that have similar conditions, such as soil, land formation and weather patterns. The combination of these conditions is better for some types of vegetation or plant growth than for other types. Alberta can be divided into five ecoregions.



RECOGNIZING THE ECOREGIONS

Each ecoregion can be described as having some common conditions which affect the agricultural production in that region. For example, the terrain or land formation in an ecoregion is one of these conditions. Even though the terrain may not be exactly the same for every spot in the ecoregion, it is generally similar throughout the region.

A description of each of the five ecoregions follows.

GRASSLANDS

Most grasslands are located in southern Alberta. The landscape is nearly treeless, and is made up of rolling plains. The dry conditions may limit agricultural production if irrigation is not available.



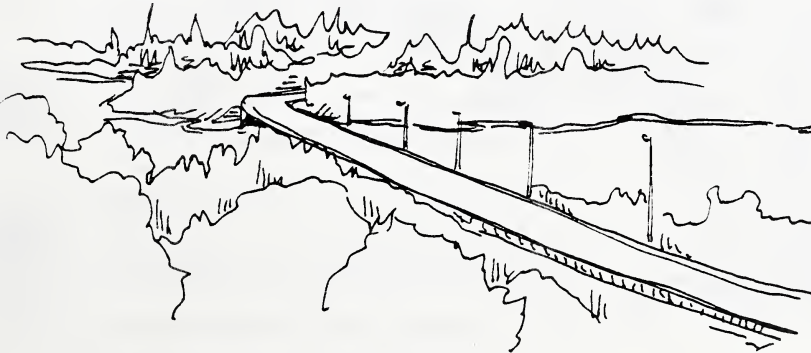
PARKLAND

Parklands are located in central Alberta and in some northern areas. The natural plant cover consists of trees and grasses. The climate is generally moderate. Parklands provide some of Alberta's most productive farmland.



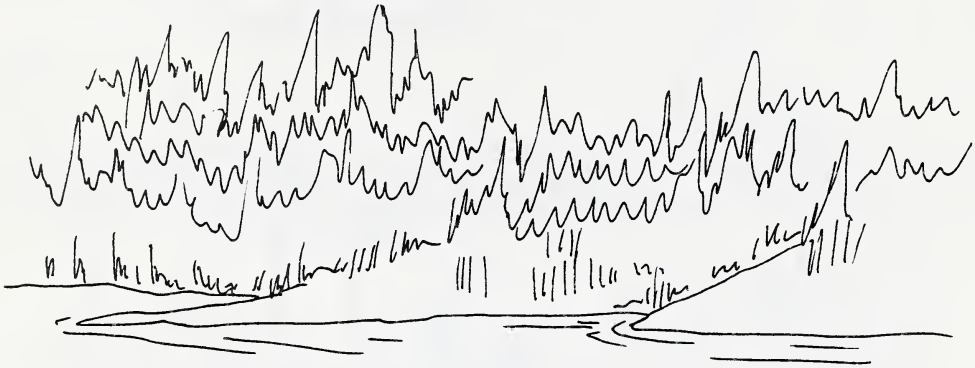
BOREAL FOREST

Boreal forest is found in most of northern Alberta. It has a nearly unbroken tree cover. The climate is variable but short summers and long winters are common. This area provides limited agricultural use.



FOOTHILLS

The northern foothills in Alberta are steep and mostly tree covered. They provide much of the timber for our lumber industry. The southern foothills in Alberta are covered with grass and are used for grazing cattle. The climate is high in precipitation and the winters usually have moderate temperatures.



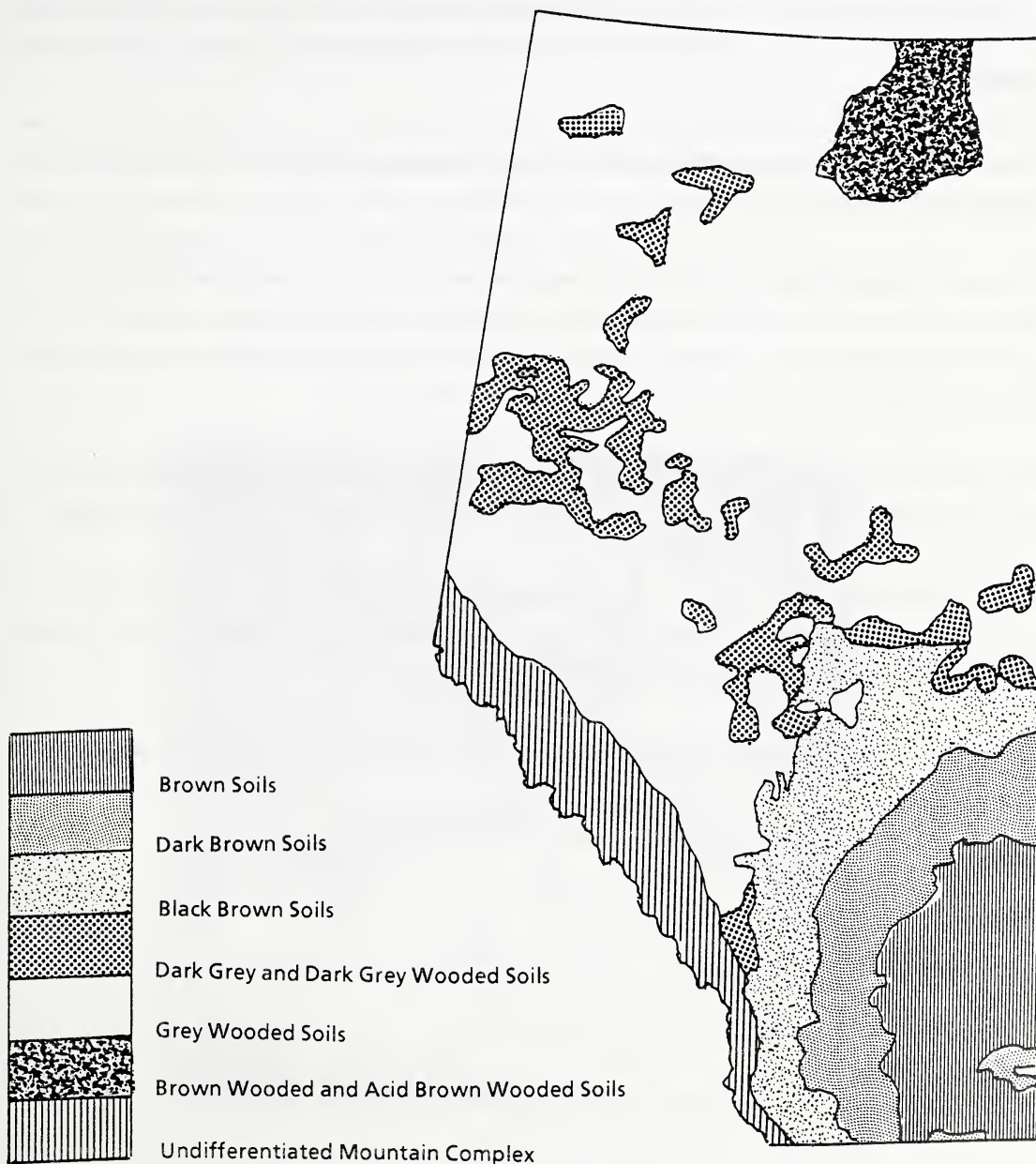
MOUNTAINS

Mountains are located on Alberta's western border. High wind velocity and high precipitation rates are common in this area. These areas have little agricultural use due to the conditions and terrain.



SOIL ZONES

Regions in Alberta are classified according to the soil most commonly found in an area. These areas are called soil zones. The following map shows the soil zones in Alberta.



STUDENT ACTIVITIES

1. Mark an "X" on the soil zone map where your community is located.
 2. Name of the soil zone in which your community is located.
-

CLIMATE

The weather has a major effect on farming. This makes it important to know the weather patterns of the area to be farmed.

The weather tends to follow a similar pattern year after year. For example, at Lethbridge, in southern Alberta, there tend to be more frost free days than at Fairview, in northern Alberta. Similarly at Olds, in the foothills area, there is usually more rain during the summer than at Taber, in the grasslands area. Some areas of the province get hail more often than other areas.

The weather conditions help the farmer to decide which crops to grow. Weather conditions are also important to the livestock farmer who must shelter animals when weather conditions are extreme.

Farmers cannot change the weather. They do, however, use the history of weather conditions in planning their farm production. The choice of crop and the methods used in production are, in part, decided by the typical weather conditions of the area.

Agricultural production is greatly affected by the weather patterns of precipitation, temperature, wind and hail.

PRECIPITATION

Precipitation is the amount of moisture provided by weather conditions.

Rain and snow are the two sources of precipitation for Alberta farms. The best moisture for farming comes from rain. Crops grow in the summer months and need moisture. The snow provides the first moisture in the spring but, after that, rain is necessary for plant growth.

Two thirds of the precipitation in this province comes from rain and one third comes from snow. Both forms of precipitation are important to the farmer. Every area of Alberta has an average amount of snowfall and rainfall each year. This is an approximate amount that can be expected in a year. The average is calculated on past snowfalls and rainfalls in the region.

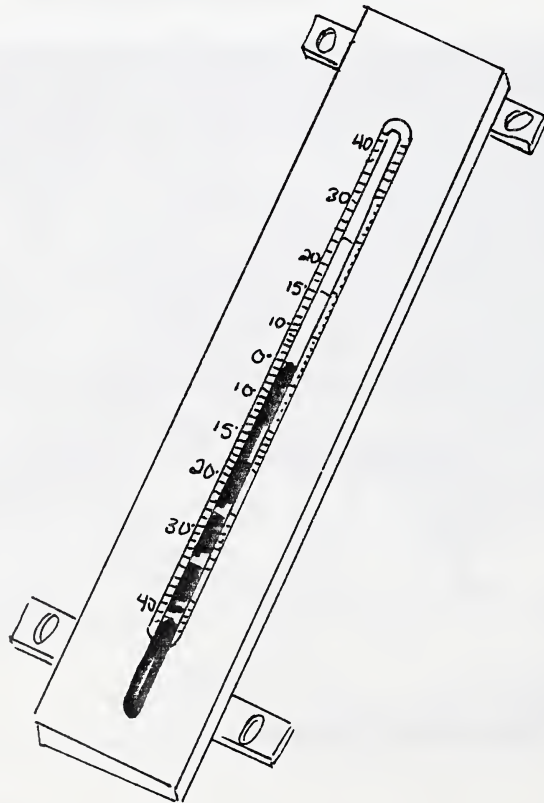


TEMPERATURE

Temperature is important to agricultural production. Production is influenced by the number of frost free days in a year and the length of the day.

Frost free days are the number of days between the last day of freezing in the spring and the first day of freezing in the fall. Southern Alberta has more frost free days than northern Alberta. The number of sunlight hours on a summer's day is the second factor important to agricultural production. In northern Alberta, there are more hours of sunshine in a summer day than in southern Alberta. This means that crops can be grown in the north, even though there are less frost free days.

The number of frost free days and the amount of sunshine on a summer's day work together to affect the length of time it takes to grow a crop. Less frost free days are needed to grow the crop if the sun in that area shines longer each day.



STUDENT ACTIVITIES

1. a. Research the information available about normal weather conditions for your community.
Information sources may include:

- library materials
- agricultural consultants
- local farmers
- almanacs.

b. Based on your research, record the following information about the local weather conditions.

- Number of frost free days yearly _____
- Average rainfall yearly _____
- Average snowfall yearly _____
- Last date for spring frost _____
- Earliest date for frost in the fall _____

- Average temperature for:

Month	Average Temperature Range
March	_____ to _____
April	_____ to _____
May	_____ to _____
June	_____ to _____
July	_____ to _____
August	_____ to _____
September	_____ to _____

WIND

The wind dries the land. Strong winds also create special problems for farmers by causing soil erosion.

The chinook winds in southwestern Alberta help the livestock farmer. They remove the snow from grazing fields so that the animals can eat the grass. However, these same winds can mean lost moisture for planting the grain farmer's crop.

STUDENT ACTIVITIES

1. Discuss the local wind conditions and answer the following questions.

- What are the windiest months of the year?

- What are the coldest months of the year?

- Are the windiest months the same as the coldest months?

- Which winds, cold or warm, are beneficial to farmers? Why? _____

- Which winds, cold or warm, are detrimental to farmers? Why? _____

HAIL

Hail damages the farm crop. Some areas of Alberta have frequent hail storms.

STUDENT ACTIVITIES

1. Invite a crop adjuster from the local hail and crop insurance office to your classroom. Use the following questions to interview this person.

- When does hail usually occur in this area?

- What does the hail do to the crop?

- At which stage of crop growth does hail do the most damage?

- How do farmers decide if they need hail insurance?

- For what other types of climatic conditions can a farmer buy crop insurance?

WEATHER AND THE SEASONS

Weather conditions can be good or bad for the farmer, depending on the season.

STUDENT ACTIVITIES

1. Decide if each of the conditions described below is good or bad for agricultural production. Give reasons for your answers.

a. SPRING CONDITIONS

- Very windy after soil is dry
- Warm days
- Steady, heavy rain
- Cold nights

b. SUMMER CONDITIONS

- Three days of gentle rain in late June
- Warm, sunny weather
- Hail in August
- One month without rain

c. FALL CONDITIONS

- Snow on September 15
- Warm, windy weather
- Heavy rain
- Ten days in September without rain
- Earlier frost than usual

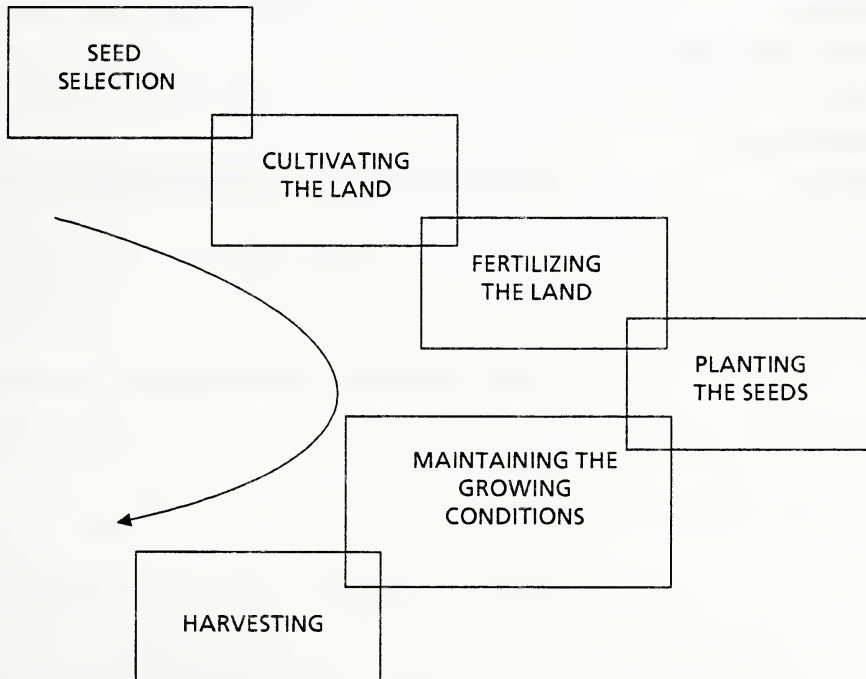
CROP PRODUCTION

Farming is an expensive business and careful planning and management is required to make a profit. There are several stages of work involved in producing a crop.

The six stages of management in crop production are:

- SEED SELECTION
- CULTIVATING THE LAND
- FERTILIZING THE LAND
- PLANTING THE SEEDS
- MAINTAINING THE GROWING CONDITIONS
- HARVESTING

Following a step by step plan to grow a crop is called crop management. The stages of management in crop production are:



JOB SHEET 19

INVESTIGATING CROP PRODUCTION

EQUIPMENT, TOOLS AND SUPPLIES

- Pencil
- Student workbook

PROCEDURE

1. During a farm field trip or extended field experience, complete the following Information Sheets related to crop production:
 - a. Seed Selection
 - b. Cultivation
 - c. Fertilizer Applications
 - d. Planting
 - e. Crop Maintenance
 - f. Harvesting.

INFORMATION SHEET

SEED SELECTION

1. What type of crops are grown on this farm?

2. If possible, collect samples of the seeds. Tape them here and label them.

3. Where does the farmer get the seed?

4. How does the farmer decide if the seed is good for growing?

5. Does the farmer get the seed cleaned and treated? Why or why not?

6. Name some jobs that are related to this stage of crop production.

7. What else did you learn about seed selection?

INFORMATION SHEET CULTIVATION

1. What equipment does the farmer use to cultivate the land?

2. How much does a complete set of cultivation equipment cost?

3. How does each piece of equipment help to prepare the land for seeding?

Equipment Name	Use

4. Describe the soil at this farmland.

5. How long does it take the farmer to prepare the fields for seeding? How much land is seeded?

6. Does the farmer seed all the fields every year? Why or why not?

7. Name some other jobs that are related to this stage of crop production.

8. What else did you learn about cultivating the land?

INFORMATION SHEET FERTILIZER APPLICATIONS

1. What kind of fertilizer does the farmer use?

2. What does fertilizer cost?

3. Does the farmer use the same fertilizer on every field?

4. How does the farmer decide which fertilizer to use?

5. Is the fertilizer diluted?

6. When does the farmer fertilize?

7. How does the farmer put the fertilizer into the soil?

8. Where does the farmer get the fertilizer?

9. Name some other jobs that are related to this stage of crop production.

10. What else did you learn about fertilizing?

INFORMATION SHEET

PLANTING

1. How does the farmer decide if the soil is warm enough to plant the seeds?

2. What equipment does the farmer use for planting the seeds?

3. How deep does the farmer plant the seeds?

4. How much seed does the farmer need for one field?

5. What is the cost of sufficient seed to plant one field?

6. Name some other jobs that are related to this stage of crop production.

7. What else did you learn about planting the crop?

INFORMATION SHEET

CROP MAINTENANCE

1. What does the farmer do to the land after the seeds are planted?

2. What pieces of equipment does the farmer use after planting the seeds?

3. What weeds does the farmer have to control?

4. How does the farmer control the weeds?

5. Describe the best weather conditions needed for the growing of these crops.

6. Name some other jobs that are related to this stage of crop production.

7. What else did you learn about maintaining growing conditions?

INFORMATION SHEET

HARVESTING

1. How does the farmer know when the crop is ready to be harvested?

2. List the steps the farmer follows for harvesting.

3. What equipment does the farmer use during harvesting?

4. Where does the farmer store the harvested product?

5. Where does the product go from the farm?

6. Name some other jobs that are related to this stage of crop production.

7. What else did you learn about harvesting?

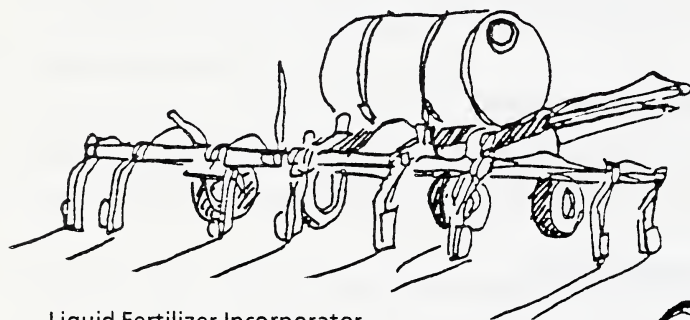
PLANT PRODUCTION EQUIPMENT

The farmer uses many different pieces of equipment in the work of crop production. Each piece of equipment must be cared for so that it works properly. This is called equipment maintenance.

Most farm equipment is machinery. Machinery needs fuel such as gasoline, diesel fuel or electricity to run. Some equipment, such as hand tools, use human power and power tools use electricity.

A hoe uses human power. A cultivator is like a hoe, but it is pulled by a tractor which uses fuel.

Common equipment used in crop production include items shown in the following illustrations:

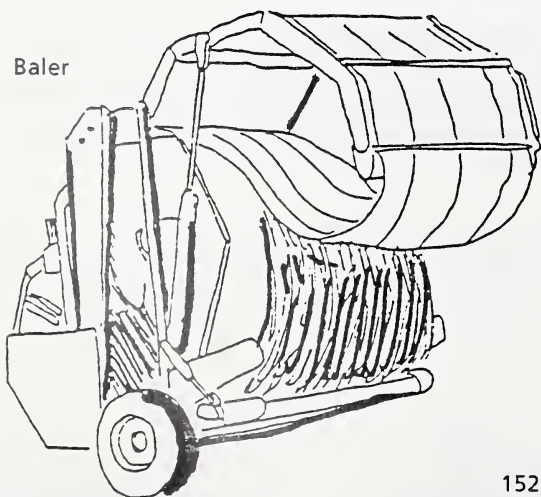


Liquid Fertilizer Incorporator

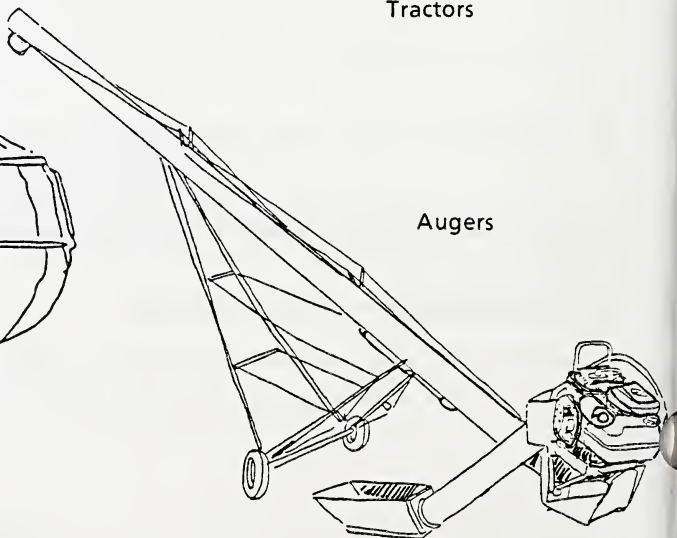


Tractors

Baler



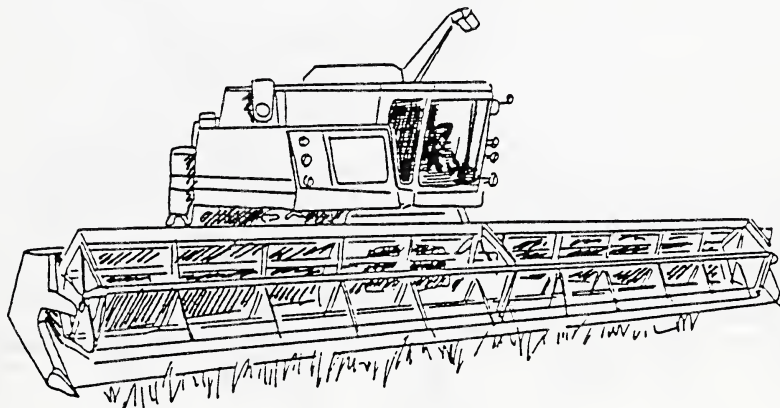
Augers



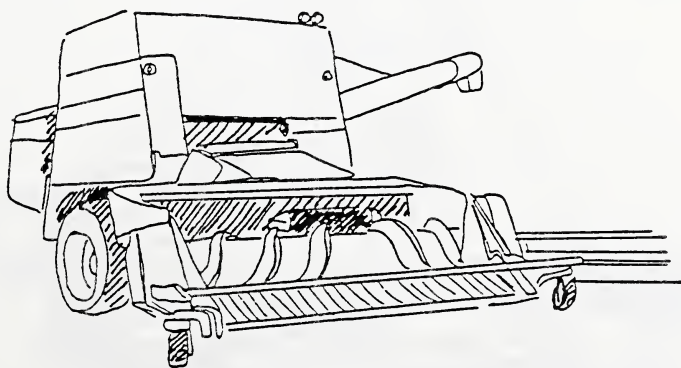
FARM MACHINERY

Farm machinery is equipment used to do work around the farmyard and fields. This equipment can be divided into two types: multipurpose machines and specialized machines. **Multipurpose** machines can be used to do more than one job; for example, a tractor can be used for loading, pulling and providing a power source. **Specialized** machines are designed to perform only one task, such as the crop baler that gathers the cut crop and compacts it into one unit.

Farm machinery can also be divided into self-propelled and pull-type machines. The **self-propelled** machines have an engine and drive train like a car or truck. **Pull-type** machines are usually hitched to a tractor and use the tractor's power and movement to become operational. Some equipment, such as balers, are commonly manufactured as pull-type machines, while others, such as combines, are available in either type.



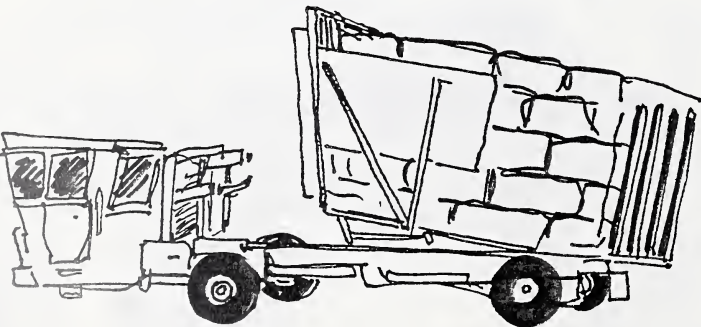
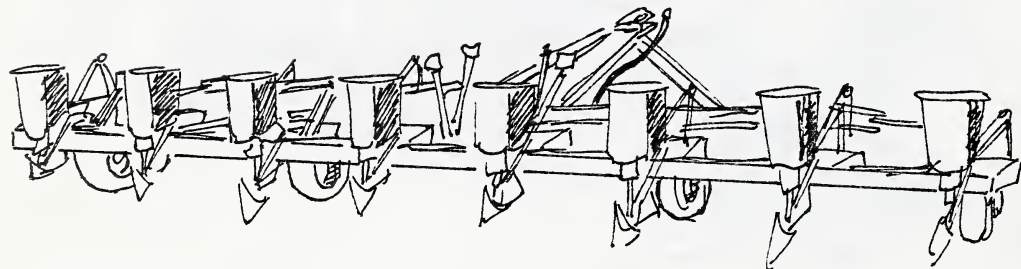
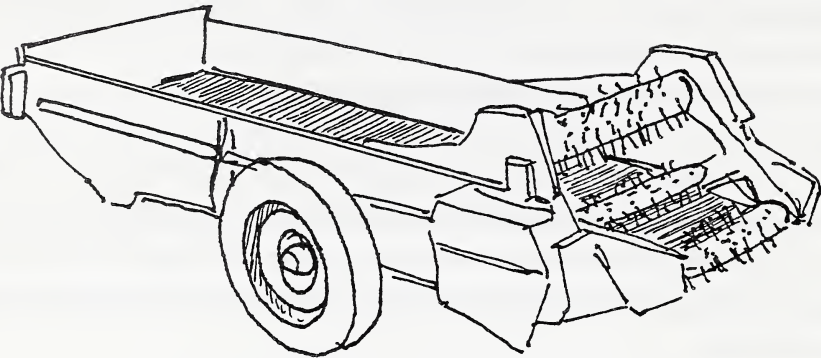
Self-Propelled Combine

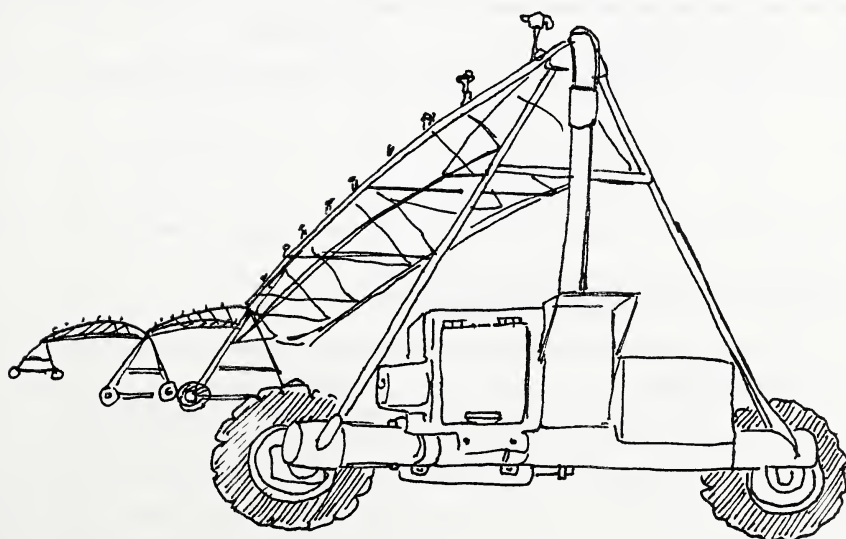
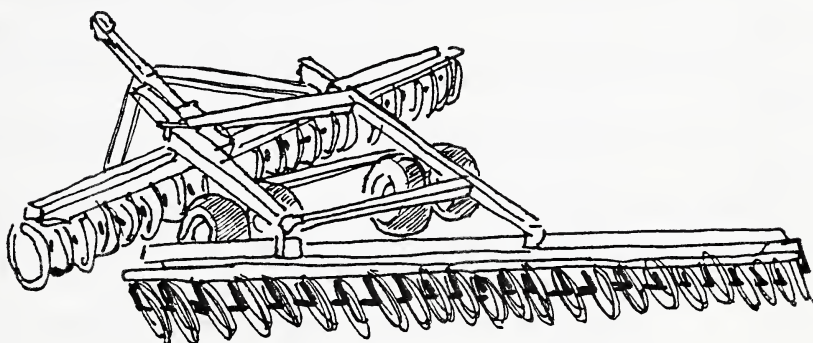
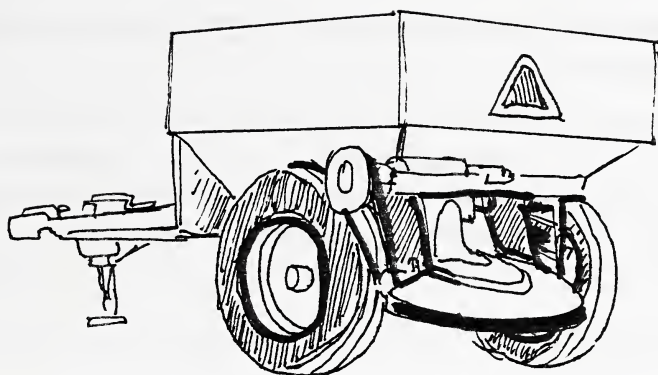


Pull-Type Combine

STUDENT ACTIVITIES

1. Label each of the following items of farm equipment.





2. Identify the power source and range of uses for the following equipment by placing a check mark (✓) in the appropriate column.

Equipment Name	POWER SOURCE		RANGE OF USES	
	Self-Propelled	Pull-Type	Multi-Purpose	Specialized
tractor	✓		✓	
combine				
manure spreader				
grain auger				
chisel plow				
grain dryer				
rotary hoe				
cultivator				
silage wagon				
field sprayer				
seed drill				
baler				

3. Describe briefly the purpose of each of the following machines.

- Tractor _____
- Combine _____
- Manure Spreader _____

- Grain Auger _____
- Chisel Plow _____
- Grain Dryer _____
- Rotary Hoe _____
- Cultivator _____
- Silage Wagon _____
- Field Sprayer _____
- Seed Drill _____
- Baler _____

4. What are the advantages and disadvantages of the following equipment?

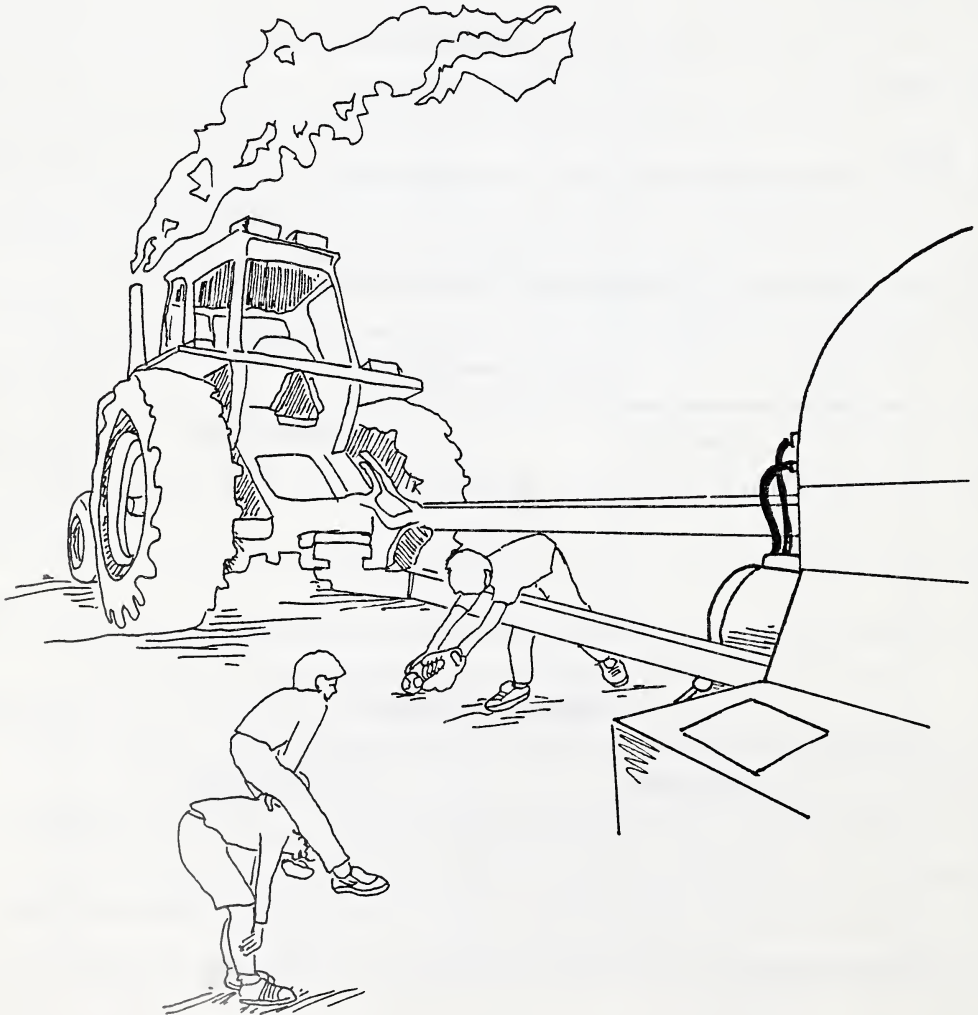
Multi-Purpose Machines	
Advantages	Disadvantages

Specialized Machines	
Advantages	Disadvantages

FARM MACHINERY SAFETY

Most of Alberta's farm accidents occur when using farm equipment. One of the best ways to avoid accidents is to be aware of the hazards. This can be done by reading and following instructions in operators' manuals and reference books, talking to experts who know the machinery, and observing correct operating and repair procedures.

Most accidents (e.g., tractor rollovers, pesticide poisonings, accidents involving grain augers) happen when operating machinery in the field. Agricultural workers must be aware of the dangers involved when using equipment and chemicals, and take appropriate safety precautions.



Alberta Agriculture indicates that 20% of all machinery accidents happen while performing maintenance or repair. Some of the equipment hazards that cause accidents are:

- rotating machinery and parts
 - power take-off shafts
 - augers
 - blades
 - belts and pulleys
 - chains and sprockets
 - gears
- hitches
- hydraulic lifts and components
 - rams
 - high pressure hoses and fittings
- sharp projections or edges on components.

STUDENT ACTIVITIES

1. Brainstorm: How can farm machinery accidents be prevented:

- when operating farm machinery?

- when repairing or maintaining farm machinery?

2. Explain how carelessness around farm machinery may cause accidents.

3. Many pieces of farm machinery are built with safety in mind. Select two pieces of farm machinery and list the safety features on each.

4. Often the operation of farm machinery requires the handling of chemicals. Brainstorm and list safe use rules and storage requirements for these farm chemicals.

JOB SHEET 20

INVESTIGATING FARM MACHINERY MAINTENANCE

EQUIPMENT, TOOLS AND SUPPLIES

- Pencil
- Student workbook

PROCEDURE

1. Visit a farm machinery dealer, agricultural mechanic or farmer to find out what care is required on farm implements.
2. Complete the following Interview Guide.

INTERVIEW GUIDE

MACHINERY CARE

- Type of Machine: _____
- Replacement Cost: _____
- What is the purpose of this machine?

- Does the machine need maintenance before each use?

- Does the machine require regular cleaning?

- How is it cleaned?

- What are the important safety features on this piece of equipment?

- Where should the machine be stored when not in use?

WORK STANDARDS AND MANAGEMENT

The major tasks of workers in any industry are to provide quality service and maintain positive relationships with clients and other workers. To achieve these goals, every supervisor has expectations that workers will be able to meet certain standards. These standards include:

1. Personal Standards

- Is punctual
- Shows initiative
- Practises personal hygiene
- Is well groomed
- Is self-directed
- Remains on task

2. Regulatory Standards

- Knows and follows safety regulations
- Knows and follows sanitary regulations
- Maintains a clean work area

3. Materials-Use Standards

- Demonstrates safe-use practices
- Cares for and maintains equipment and tools
- Conserves supply items

4. Interpersonal Standards

- Shows respect for others
- Demonstrates respect for property
- Has a positive attitude to work
- Has a pleasant personality

Throughout the course you will be evaluated on how well you are meeting these standards.

To help you identify the standards expected of you during this course, evaluate yourself using Appendix 2: Work Standards and Management Monthly Evaluation Chart.

Make several copies of the chart and at the end of each month evaluate your performance. Check each evaluation against previous evaluations and note the improvements.

JOB SHEET 21

INVESTIGATING WORK STANDARDS

EQUIPMENT, TOOLS AND SUPPLIES

- Pencil
- Student workbook

PROCEDURE

1. Interview someone who is employed at a local agriculture related business. This could be a farm implements dealership, a fertilizer dealer, a seed cleaning plant or a farm supply store. Find out about the work standards at this workplace. Complete the following Interview Guide.

INTERVIEW GUIDE

- What kind of services does this business offer?

- What time does work start?

- What is the appropriate clothing for this workplace?

- What safety rules must be followed by the employees?

- How are employees expected to treat customers?

- What are the other work standards for this workplace?

2. Interview someone in the food industry to learn about the work standards at a food related workplace. You may choose to interview a person from a processing plant (for example, a flour mill), or a retail outlet such as a bakery, a butcher shop, a grocery store or some other food industry in the local community. Complete the questions on the following Interview Guide.

INTERVIEW GUIDE

FOOD INDUSTRY

If a job involves the processing or selling of food, there are two types of standards. These are:

- standards for the employee's work
- standards that keep the food safe to eat.

- What is the appropriate clothing for this workplace?

- How does the clothing aid in the safety of the food or the employee?

- Is the food inspected at this workplace? If so, by whom and why?

- What safety rules protect the employees at this workplace?

- What rules protect the food from being contaminated?

- What is expected of employees who deal with customers in this workplace?

- What are the other work standards for this workplace?

AGRICULTURAL PRODUCTION 16 PROFILE

JOB SCOPE	1	2	3	4
	Defines agriculture	Identifies Alberta agricultural products	Identifies occupations in agricultural production	Identifies local agricultural production or processing businesses
	1	2	3	4
	Identifies historical changes in local agricultural production	Identifies reasons for changes in local agricultural production	Recognizes effects of changes	Identifies trends in production
HISTORICAL DEVELOPMENT OF AGRICULTURE	1	2	3	4
	Defines the terms: food chain, producers, consumers and products	Recognizes the main components of the food chain	Identifies and lists a food chain	
	1	2	3	4
	Defines producer and consumer products	Identifies steps used to move products between producers and consumers	Identifies occupations found in each step	Identifies local producers
FOOD CHAIN	1	2	3	4
	Identifies local consumer trends and practices			
	1	2	3	4
	Recognizes land as a natural resource	Identifies forms of land use	Identifies forms of land ownership	
PRODUCERS AND CONSUMERS	1	2	3	4
	Describes origins of soil	Identifies physical features of soil	Describes soil fertility as it relates to soil layers	Recognizes causes and effects of soil erosion by wind and water
	1	2	3	4
	Identifies the basic structure of plants	Explains basic functions of plant parts	Identifies agricultural plant parts	Identifies local plants used in agricultural production
LAND AS A RESOURCE	5	6	7	8
	Describes process of germination	Demonstrates plant germination under a variety of conditions	Identifies fertilizer nutrients	Recognizes purposes of fertilizer nutrients
	1	2	3	4
SOIL	1	2	3	4
	Describes origins of soil	Identifies physical features of soil	Describes soil fertility as it relates to soil layers	Recognizes causes and effects of soil erosion by wind and water
	1	2	3	4
	Identifies the basic structure of plants	Explains basic functions of plant parts	Identifies agricultural plant parts	Identifies local plants used in agricultural production
PLANTS	5	6	7	8
	Describes process of germination	Demonstrates plant germination under a variety of conditions	Identifies fertilizer nutrients	Recognizes purposes of fertilizer nutrients
	1	2	3	4

AGRICULTURAL PRODUCTION 16

PROFILE (continued)

	1	2	3	4
FACTORS OF PRODUCTION	Defines factors of production	Identifies local ecoregion	Recognizes local soil zone	Identifies effects of a variety of climatic conditions
GROWING CROPS	1 Applies basic skills and knowledge to in-school experiments	2 Applies basic knowledge and skills to on-location farming experiences	3 Identifies occupations related to each step in the production process	
FARM SAFETY	1 Identifies safety practices related to agricultural production	2 Identifies hazards related to agricultural production		
EQUIPMENT CARE	1 Identifies and lists equipment used	2 Recognizes need for regular care and maintenance of tools and equipment	3 Describes correct tool and equipment maintenance procedures	
WORK STANDARDS	1 Identifies work standards in agricultural production	2 Identifies safety procedures and practices	3 Demonstrates correct safety procedures and practices	
SUPPLY MANAGEMENT	1 Identifies appropriate supply management practices			
WORK AREA MANAGEMENT	1 Recognizes need for regular care and maintenance of work area	2 Demonstrates appropriate care and maintenance of work area	3 Practises correct cleaning of tools and equipment	

WORK STANDARDS AND MANAGEMENT MONTHLY EVALUATION CHART

Name _____ Date _____	Evaluation	
	Satisfactory	Unsatisfactory
DEMONSTRATES APPROPRIATE WORK HABITS		
Is punctual		
Comes prepared to work		
Prepares immediately for work		
Performs duties as instructed, with acceptable accuracy		
Uses time productively		
Considers solutions to problems before asking for assistance		
FOLLOWS RULES AND REGULATIONS		
Follows acceptable safety and sanitation procedures		
Does not bring food or drink into the work area		
Dresses appropriately		
Uses equipment, tools and supplies as instructed		
Clears work area after use		
Performs required clean-up duties		
DEMONSTRATES CONCERN FOR SAFETY		
Demonstrates safety practices		
Maintains a safe and sanitary work area		
Wipes up spills immediately		
Does not leave work area without permission		
DEMONSTRATES PROFESSIONAL ATTITUDE		
Displays a professional appearance		
Is friendly and courteous		
Advises teacher/supervisor of hazards or necessary repairs		
Informs teacher/supervisor in advance of absences		
Demonstrates responsibility for completion of assignments and tasks		
Follows verbal and written instructions		
Demonstrates an organized work approach		

Areas to improve next month are:

JOB SHEET EVALUATION RECORD

JOB SHEET	EVALUATION								
	Self			Classmate			Teacher/Supervisor		
	1	2	3	1	2	3	1	2	3
1. Investigating an Agricultural Career									
2. Investigating Antique Farm Equipment									
3. Investigating Changes Caused by Technology									
4. Testing Soil Fertility									
5. Identifying Soil Structure									
6. Separating Soil Components									
7. Performing a Ribbon Test									
8. Performing a Soil-feel Test									
9. Testing Soil Permeability									
10. Demonstrating Soil Water Movement									
11. Drawing Erosion Features									
12. Demonstrating Water Erosion									
13. Demonstrating Water Movement									
14. Demonstrating the Importance of Chlorophyll									
15. Examining Plant Leaves									
16. Demonstrating the Effect of Temperature on Germination									
17. Demonstrating the Effect of Moisture on Germination									

JOB SHEET EVALUATION RECORD (continued)

JOB SHEET	EVALUATION								
	Self			Classmate			Teacher/Supervisor		
	1	2	3	1	2	3	1	2	3
18. Testing Germination Rates									
19. Investigating Crop Production									
20. Investigating Farm Machinery Maintenance									
21. Investigating Work Standards									

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Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains. The *Agrobacterium* strains were incubated with the plant explants for 24 h. The explants were then cultured on the selective medium. The number of explants transformed was counted. The results are the mean \pm SD of three independent experiments. * indicates a significant difference ($p < 0.05$) between the control and the treated explants.

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